Welcome!

Thank you for your interest in the EECS Department's Computer Science program in the College of Engineering. The fast rate of innovation in computer technology has created many new, exciting opportunities for students with Computer Science undergraduate degrees. Employment opportunities include: software development, game design, medicine, computer graphics, security, business management, consulting, computer systems analysis, data communications administration, robotics, artificial intelligence, knowledge engineering, hardware development, and many others. In addition, an undergraduate degree in Computer Science provides opportunities for masters, doctoral, and professional studies in various fields.

Computer science is an exceptional field. Computers have been around for only 60 years while most other scientific disciplines have been around for centuries. Progress in computer science has been extraordinarily rapid during this period, and computers have had a profound impact on society (can you envision life without text messaging, social networking, and Wifi?). Computer science research has provided much of the intellectual foundation and creative energy that fueled that transformation, and it continues to be an extremely exciting field.

Computer Science—College of Engineering (CS-Eng) Declaration Requirements

To declare a major in CS-Eng, you must be a College of Engineering student and:

1. Have completed at least one full term at UM Ann Arbor
2. Have an overall UM GPA of 2.0 or better in courses taken at the UM Ann Arbor campus and be in good standing
3. Have completed or earned credit by exam or transfer for at least one course in each of these categories:
   a. Calculus (e.g. Math 115, 116 or 156)
   b. Calculus-based physics lectures (e.g. Physics 140 or 160) or chemistry lectures (e.g. Chem 130)
   c. Required engineering courses (Engr 100, 101, or 151)

If you are interested in declaring a CS-Eng major and do not meet these requirements, please schedule an appointment with the CS-Eng Chief Program Advisor (CPA) to discuss your situation.

Getting Advice and Information

If you are a CS-Eng Major or considering becoming one, you should meet with a CS-Eng Advisor every semester, even if you know what courses you want to take. There may be options or constraints of which you are unaware. Frequent meetings with an advisor will help ensure that you get the most out of your education here and that there are no surprises when you apply for your diploma. You can schedule an advising appointment online.

Check the CSE Advising site (https://cse.engin.umich.edu/academics/for-current-students/advising/) for information about registration procedures, course offerings, book lists, time schedules, advising hours, and career information. You may contact the CS Undergraduate Advising Office (2808 BBB) at ugadmin@eecs.umich.edu or (734) 763-6563, or you may contact the CS-Eng Chief Program Advisor at csengadvisor@umich.edu.

This document covers rules and advice for the CS-Eng program for Fall 2012 – Summer 2022. Your program is determined by the rules that were in effect when you entered the College of Engineering. If you entered the College of Engineering before Fall 2012, you are covered by a different set of rules.
(Fall 2012–Summer 2022) Computer Science–Eng
CS-Eng & CoE Program Requirements & Grade Policies

College of Engineering Core Requirements

1. Engineering 100, and [Engineering 101 or Engineering 151 or EECS 180 AP credit]
2. [Chemistry 125, Chemistry 126, and Chemistry 130] or [Chemistry 210 and Chemistry 211]
3. Physics 140, Physics 141, Physics 240, and Physics 241
4. Math:
   a. Math 115 or Math 120 (AP)
   b. Math 116 or Math 121 (AP)
   c. Math 214 (can also be satisfied with Math 217, Math 417, Math 419, or Robotics 101)
   d. Math 215 or Math 216 (If both Math 215 and Math 216 are taken, Math 216 can count as a Flexible Technical Elective.)
5. Intellectual Breadth: rules for this College requirement can be found in the CoE Bulletin under the "Intellectual Breadth" heading at https://bulletin.engin.umich.edu/ug-ed/regs/.
6. General Electives: 15 credits are “required”; CoE degrees require 128 total credits, and more or fewer GE credits may be needed to achieve this total depending on individual factors in a student's record.

Computer Science in Engineering Program Requirements

1. Program Core: All of the following courses are required:
   a. Computer Science: EECS 203 (or MATH 465/565*), EECS 280, EECS 281, EECS 370, EECS 376, and EECS 496 (*Note that MATH 465/565 require significantly more mathematical background than does EECS 203. Speak to an advisor before selecting these courses.)
   b. Probability and Statistics: STATS 250 or STATS 280 or STATS 412 or STATS 426 or EECS 301 or EECS 401 or IOE 265 or TO 301. (IOE 265 is generally open only to undeclared or IOE students. Students with credit from Statistics AP exams should pursue STATS 280 for this requirement. Dual major/dual degree students, see the “Double major information” heading at https://cse.engin.umich.edu/academics/undergraduate/computer-science-eng/ for possible substitutions.)
   c. Technical Communications: TCHNCLCM 300

2. Technical Electives: A minimum of 26 additional credits of technical electives is required:
   a. At least 16 of these credits must be in approved Upper Level CS Technical Electives (a list of approved courses is located on page 5).
   b. The remainder of the technical elective credits may be chosen from the approved Flexible Technical Electives lists (the CS-specific list is located on page 5; Flex Techs in other fields are listed online at https://cse.engin.umich.edu/academics/undergraduate/computer-science-eng/cs-eng-flexible-technical-electives/ where there are courses in engineering, mathematics, or science that are approved as appropriate for CS students).

3. Major Design Experience (MDE): The MDE is a capstone design project that is recommended to be taken during one of your final two semesters. The technical writing requirement (b., below) must be taken in the same or later semester as the MDE (preferably the same semester).
   a. A CS MDE design project course: EECS 440 or EECS 441 or EECS 449 or EECS 467 or EECS 470 or EECS 473 or EECS 480 or EECS 494 or EECS 495 or EECS 497 (some EECS 498 sections may be approved as MDE; see website).
      i. Please see details on how to complete MDE on an MDP project here: https://mdp.engin.umich.edu/cs/
   b. Technical writing and oral presentation: TCHNCLCM 497 or TCHNCLCM 496.

EECS Grading & Repeat Policies
A grade of C or higher is required in any of the College Core, Program Core, or Technical Electives. A grade of a C- in these courses is not considered a passing grade and the course must be repeated or substituted with another. [Note: Grades of C- through D- are acceptable for Intellectual Breadth or General Electives.] Students are limited to attempting each of the three 200-level courses (EECS 203, EECS 280, EECS 281) at most twice. An attempt includes, but is not limited to, a notation of any letter grade (“A-F”), Withdraw (“W”), Pass/Fail (“P/F”), Transfer (“T”), or Incomplete (“I”) posted on the U-M transcript. Any attempt from WN20, FA20, SP/SS20, and WN21 terms
(Fall 2012–Summer 2022) Computer Science–Eng
Prerequisites and College Policies

**College of Engineering Policies**

**Intellectual Breadth**: Intellectual Breadth requirements are complex and not always intuitive. For details, see the CoE Bulletin under the “Intellectual Breadth” heading at [https://bulletin.engin.umich.edu/ug-ed/regs/](https://bulletin.engin.umich.edu/ug-ed/regs/). Further questions about this requirement can be directed to the EECS Undergraduate Advising Office. [Note that Test Credit for Foreign Languages (AP credits and credits by exam) at the 100-level count only as general electives.]

**Dual majors**: To earn dual majors within Engineering, you must satisfy the requirements for both programs and take at least 14 additional credit hours of pertinent technical electives beyond either major (142 credits total). You should schedule advising appointments at both departments to determine allowable overlap among requirements.

**Pass/Fail** is only allowed for Intellectual Breadth requirements and general electives. You may take at most 2 courses pass/fail per term (1 during Spring or Summer half-terms) and at most 14 credits total. This can be a good way to maintain a good GPA while exploring different types of courses within the University.

**Transfer credit**: UM maintains a list of approved transfer courses from other U.S. institutions at [https://transfercredit.ugadmiss.umich.edu/](https://transfercredit.ugadmiss.umich.edu/). Transfer courses from international institutions can be found at [https://apps.engin.umich.edu/equivalencies/](https://apps.engin.umich.edu/equivalencies/) for CoE and [https://www.ugadmiss.umich.edu/TCE/Public/CT_TCESearch.aspx](https://www.ugadmiss.umich.edu/TCE/Public/CT_TCESearch.aspx) for non-CoE courses. Courses that do not
appear on one of these lists may still transfer but will need to be reviewed. Keep in mind that you must take 50 credits hours (including 30 hours of 300-level or above of technical credits) on the Ann Arbor campus.
# CS-Eng Sample Schedule

Below is an eight-semester (four-year) plan to help students envision how requirements may fit together over the course of their time at Michigan. This plan is only a sample; it is not necessary to follow the below plan exactly outside of following prerequisite chains. For more planning assistance, students should schedule an appointment with an advisor on the EECS undergraduate website.

<table>
<thead>
<tr>
<th>Total Credits</th>
<th>Terms 1</th>
<th>Terms 2</th>
<th>Terms 3</th>
<th>Terms 4</th>
<th>Terms 5</th>
<th>Terms 6</th>
<th>Terms 7</th>
<th>Terms 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>128</td>
<td>17</td>
<td>17</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>14</td>
</tr>
</tbody>
</table>

## Subjects Required by all Programs (55 hours)

- Mathematics 115, 116, and 214\(^1\) 
  - Credits: 12 | Terms: 4, 4, 4
- Mathematics 215 or 216\(^2\) 
  - Credits: 4 | Terms: 4
- Engineering 100, Introduction to Engineering 
  - Credits: 4 | Terms: 4
- Engineering 101, Introduction to Computers 
  - Credits: 4 | Terms: 4
- Chemistry [125/126 and 130] or Chemistry [210 and 211] 
  - Credits: 5 | Terms: 5
- Physics 140 and Lab 141 
  - Credits: 5 | Terms: 5
- Physics 240 and Lab 241 
  - Credits: 5 | Terms: 5
- Intellectual Breadth 
  - Credits: 16 | Terms: 4, 4, 4, 4

## Program Subjects (26 hours)

- EECS 203, Discrete Mathematics (or MATH 465/565) 
  - Credits: 4 | Terms: 4
- EECS 280, Programming and Elementary Data Structures 
  - Credits: 4 | Terms: 4
- EECS 281, Data Structures and Algorithms 
  - Credits: 4 | Terms: 4
- EECS 370, Introduction to Computer Organization 
  - Credits: 4 | Terms: 4
- STATS 250 or STATS 280 or STATS 412 or STATS 426 or EECS 301/401 or TO 301 or IOE 265 
  - Credits: 3 | Terms: 3
- EECS 376, Foundations of Computer Science 
  - Credits: 4 | Terms: 4
- TCHNCLCM 300 
  - Credits: 1 | Terms: 1
- EECS 496 
  - Credits: 2 | Terms: 2

## Major Design Experience (6 hours)

- Approved CS MDE course\(^3\) 
  - Credits: 4 | Terms: 4
- TCHNCLCM 497 or 496 
  - Credits: 2 | Terms: 2

## Technical Electives (26 hours)

- Upper Level CS Technical Electives\(^4\) 
  - Credits: 16 | Terms: 4, 4, 8
- Flexible Technical Electives\(^5\) 
  - Credits: 10 | Terms: 4, 4, 2

## General Electives (15 hours)

- Credits: 15 | Terms: 3, 4, 4, 4

## Total

- Credits: 128 | Terms: 17, 17, 16, 16, 16, 16, 16, 14

**Notes:**

- Credits from a course may only be used to fulfill a single requirement (no double-counting).

1. The requirements for MATH 214 can alternatively be satisfied by MATH 217, 417, 419, or Robotics 101.
2. If both MATH 215 and MATH 216 are taken, MATH 216 can count as a Flexible Technical Elective.
3. See page 5 for the current list. TCHNCLCM 497 must be taken in the same or later semester as the MDE (preferably the same semester).
4. See page 5 for the current list.
5. A maximum of 4 credits of EECS 499/399 (or other upper-level directed/independent study) may count in Flexible Technical Electives; additional will count as general electives. Check with an advisor to ensure you are not in violation of this policy.
Discuss your elective choices with an EECS faculty member in your area of interest, or with a CS advisor. Courses that have been approved as a CS MDE course are highlighted in bold in the lists below. Note: An EECS course may only count toward one requirement—either ULCS or MDE, not both.

Upper-Level CS (ULCS) Electives
You must take at least 16 credits of Upper-Level CS (ULCS) Electives from the list below. All technical elective credits can be CS Technical Electives, and we encourage students to take more than the minimum. Any credits you earn in ULCS courses beyond the minimum 16 will count toward your Flexible Technical Electives requirement.

Flexible CS Technical Electives
The following courses are approved as Flexible CS Technical Electives (Flex Techs in other fields are listed online at [https://cse.engin.umich.edu/academics/undergraduate/computer-science-eng/cs-eng-flexible-technical-electives/](https://cse.engin.umich.edu/academics/undergraduate/computer-science-eng/cs-eng-flexible-technical-electives/)). This list includes courses at the graduate level (numbered 500 and above). Students with interests in research, graduate school, and/or specific areas should discuss this with the Chief Program Advisor, who may approve graduate courses on a per-student basis for use as ULCS (approval must be obtained before registering for one).

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Course Code</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>427</td>
<td>VLSI Design I</td>
<td>482</td>
<td>Introduction to Operating Systems</td>
</tr>
<tr>
<td>428</td>
<td>Introduction to Computer Security</td>
<td>483</td>
<td>Compiler Construction</td>
</tr>
<tr>
<td>429</td>
<td>Programming Paradigms</td>
<td>484</td>
<td>Database Management Systems</td>
</tr>
<tr>
<td>430</td>
<td>Introduction to Machine Learning</td>
<td>485</td>
<td>Web Database and Information Systems</td>
</tr>
<tr>
<td>470</td>
<td>Computer Architecture</td>
<td>486</td>
<td>Information Retrieval &amp; Web Search</td>
</tr>
<tr>
<td>471</td>
<td>Applied Parallel Programming with GPUs</td>
<td>487</td>
<td>Introduction to Natural Language Processing</td>
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<tr>
<td>475</td>
<td>Introduction to Cryptography</td>
<td>489</td>
<td>Computer Networks</td>
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<tr>
<td>476</td>
<td>Data Mining</td>
<td>490</td>
<td>Programming Languages</td>
</tr>
<tr>
<td>477</td>
<td>Introduction to Algorithms</td>
<td>491</td>
<td>Introduction to Distributed Systems</td>
</tr>
<tr>
<td>478</td>
<td>Logic Circuit Synthesis and Optimization</td>
<td>492</td>
<td>Introduction to Artificial Intelligence</td>
</tr>
<tr>
<td>479</td>
<td>Introduction to Algorithms</td>
<td>493</td>
<td>User Interface Development</td>
</tr>
<tr>
<td>480</td>
<td>Advanced Computer Networks</td>
<td>494</td>
<td>Advanced Compilers</td>
</tr>
<tr>
<td>481</td>
<td>Software Engineering (taken FA17 or after)</td>
<td>495</td>
<td>Advanced Data Mining</td>
</tr>
<tr>
<td>482</td>
<td>Introduction to Operating Systems</td>
<td>496</td>
<td>CAD Verification of Digital Systems</td>
</tr>
<tr>
<td>483</td>
<td>Compiler Construction</td>
<td>497</td>
<td>Digital System Testing</td>
</tr>
<tr>
<td>484</td>
<td>Database Management Systems</td>
<td>498</td>
<td>Advanced Computer Graphics</td>
</tr>
<tr>
<td>485</td>
<td>Web Database and Information Systems</td>
<td>499</td>
<td>Software Engineering Tools</td>
</tr>
<tr>
<td>486</td>
<td>Information Retrieval &amp; Web Search</td>
<td>500</td>
<td>Advanced Operating Systems</td>
</tr>
<tr>
<td>487</td>
<td>Introduction to Natural Language Processing</td>
<td>501</td>
<td>Advanced Compilers</td>
</tr>
<tr>
<td>488</td>
<td>Computer Networks</td>
<td>502</td>
<td>Advanced Database Systems</td>
</tr>
<tr>
<td>489</td>
<td>Programming Languages</td>
<td>503</td>
<td>Design and Analysis of Algorithms</td>
</tr>
<tr>
<td>490</td>
<td>Introduction to Distributed Systems</td>
<td>504</td>
<td>Parallel Computing</td>
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<tr>
<td>491</td>
<td>Introduction to Distributed Systems</td>
<td>505</td>
<td>Computer and Network Security</td>
</tr>
<tr>
<td>492</td>
<td>Introduction to Artificial Intelligence</td>
<td>506</td>
<td>Advanced Computer Networks</td>
</tr>
<tr>
<td>493</td>
<td>User Interface Development</td>
<td>507</td>
<td>Advanced Programming Languages</td>
</tr>
<tr>
<td>494</td>
<td>Advanced Compilers</td>
<td>508</td>
<td>Distributed Systems</td>
</tr>
<tr>
<td>495</td>
<td>Advanced Program Development</td>
<td>509</td>
<td>Introduction to Adaptative Systems</td>
</tr>
<tr>
<td>496</td>
<td>Advanced Compilers</td>
<td>510</td>
<td>Natural Language Processing</td>
</tr>
<tr>
<td>497</td>
<td>Advanced Database Systems</td>
<td>511</td>
<td>ROB 320 Robot Operating Systems</td>
</tr>
</tbody>
</table>

**Note:** EECS 398, 498, and 598 are Special Topics courses. Individual sections may carry approvals as MDE, ULCS elective credit, or CS Flexible Technical elective credit. Approved requirements for each section are listed online every term at [https://cse.engin.umich.edu/academics/course-information/special-topics-courses/](https://cse.engin.umich.edu/academics/course-information/special-topics-courses/).

Elective Groups
The CS program has no official specializations, and we encourage students to take electives across a broad range of topics in computer science. However, if you want to specialize in a specific topic, consider these groupings:

- **Computer hardware:** 270, 373, 427, 470, 478
- **Computing infrastructure:** 482, 483, 484, 489, 491
- **Intelligent systems:** 442, 445, 467, 486, 492
- **Software development:** 482, 484, 485, 494
- **Theory of computation:** 475, 477, 490
- **Web technology & applications:** 285, 388, 485, 493, 486
**GENERAL ADVICE**

**Mental Health:** If you’re feeling stressed, depressed, or just need someone to talk to, there are many places to find support on campus: [https://care.engin.umich.edu/student-support-services/](https://care.engin.umich.edu/student-support-services/).

**Information from Friends:** Your friends can be a good source of information on certain topics, like the workload in courses they have taken. However, they can be an unreliable source of information for details of program and college requirements. For specific questions about program requirements, always check with the advising office rather than relying on word-of-mouth.

**Directed / Independent Study and Research:** Only 4 hours of directed/independent study or research courses (total across all depts., i.e. EECS, ENGR, IOE, Civil, etc.) can count toward Flexible Technical Electives. EECS 499 is only open to seniors; sophomores & juniors should consider EECS 399 (either can count as Flexible Technical Elective credit, up to 4 credits).

**Course Sequencing and Workload:** Student feedback about workload in CS courses can be found online: [http://cse.engin.umich.edu/academics/course-information/workload-surveys/](http://cse.engin.umich.edu/academics/course-information/workload-surveys/). There is considerable variance for courses because different students find different aspects of courses challenging (writing complicated programs, understanding math concepts, etc.) Below is a summary synthesizing workload survey data with other relevant course information to estimate workload:

- **Extremely heavy workload:** 467, 470, 473, 482, 494
- **Heavy workload:** 281, 373, 445, 483, 489
- **Moderate workload:** 203, 280, 285, 370, 376, 388, 442, 475, 477, 478, 481, 484, 485, 490, 492
- **Light workload:** 183, 441, 486, 493, 496, 497

CS courses can be more demanding relative to many courses at the University, so we advise students to avoid overloading themselves. For most CS students, a load of 2 CS courses in the same semester is normal, but that can vary based on the combination of CS courses chosen (e.g., a CS course with an extremely heavy load should only be paired with one with a moderate load or less), as well as what non-CS courses are being taken at the same time. We encourage students to talk with CSE advisors if they have questions about the course load they are considering.

**EECS 203 & EECS 280:** Taking EECS 203 (Discrete Structures) and EECS 280 (Programming) simultaneously often works well, and these are the prereqs for the "gateway" course, EECS 281 (Data Structures & Algorithms).

**EECS 281:** Take EECS 281 as soon as you can. This is the "gateway" course to all Upper Level CS Courses.

**EECS 270 & 370:** Many students say that EECS 270 (which counts as a CS Flexible Tech Elective) makes EECS 370 easier. Others say that the 203 prerequisite is good enough and don’t want to use a flexible technical elective on 270. You will probably get more out of 370 by taking 270 first, but this is not required.

**TCHNCLCM 300 is a prerequisite for TCHNCLCM 497.** The Technical Communications department manages all TCHNCLCM courses. Please visit [https://techcom.engin.umich.edu/](https://techcom.engin.umich.edu/) for questions or issues with registration of these courses.

**DEPARTMENTAL OPPORTUNITIES**

**Research:** A great deal of leading-edge academic research is carried out at UM. If you show that you can do the work, you can get involved in this research as an undergraduate, which will provide you with extraordinarily valuable training for future work in the field. For more details, see [https://cse.engin.umich.edu/academics/undergraduate-research/](https://cse.engin.umich.edu/academics/undergraduate-research/).

**Teaching—Become an Instructional Aid:** The discussion sections for EECS 183, EECS 280, EECS 281, and ENGR 100 (CSE-based topics) are led primarily by undergraduates. As a section leader, you will have the chance to teach the next generation of CSE majors and get them excited about computing. Look for IA hiring announcements via email each term.

**Mentoring—Become a Peer Advisor:** Share your experiences with other undergraduates. If you are interested, check in with the CSE Undergraduate Advising Office for information. Opportunities are available at both the department and CoE levels.

**Getting Involved—Join an EECS Student Group:** Enhance your undergraduate experience and resume by joining a student group: [https://cse.engin.umich.edu/culture/student-groups-and-teams/](https://cse.engin.umich.edu/culture/student-groups-and-teams/).

**Getting Experience—Internships, Co-ops, and Job Opportunities:** Many companies hire students for internships upon completion of EECS 281 (for some, even after EECS 280!). You can view current CS intern & job opportunities through the Engineering Career Resource Center (ECRC), [https://career.engin.umich.edu/](https://career.engin.umich.edu/), or through the fall and winter Career Fairs, [https://career.engin.umich.edu/events/career-fairs/](https://career.engin.umich.edu/events/career-fairs/).