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 and exciting opportunities for students with Computer Science undergraduate degrees. Employment opportunities include positions in: 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. Major employers of recent graduates include many prominent U.S. corporations and research laboratories, such as Amazon, Apple, AT&T, Boeing, Cisco, Deutsche Bank, Electronic Arts, Facebook, Google, IBM, Intel, Microsoft, NASA, PricewaterhouseCoopers, 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:

(a) Have completed at least one full term at UM Ann Arbor
(b) Have an overall UM GPA of 2.0 or better in courses taken at the UM Ann Arbor campus and be in good standing
(c) 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, 156)
   b. Calculus-based physics lectures (e.g. Physics 140, 160) or chemistry lectures (e.g. Chem 130)
   c. Required engineering courses (Engr 100, 101, 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, we recommend that you see a CS-Eng Faculty Advisor every term, 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. To schedule an appointment with a CS-Eng Faculty Advisor, visit http://www.eecs.umich.edu/eecs/undergraduate.

Check the EECS Advising web page, http://www.eecs.umich.edu/eecs/undergraduate for information about registration procedures, course offerings, book lists, time schedules, advising hours, and career information. You may also e-mail the CS Undergraduate Program Coordinator or the CS-Eng Chief Program Advisor at csengadvisor@umich.edu.

This document covers rules and advice for the CS-Eng program for the Fall 2012 - Summer 2014 academic year. 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.

Computer Science Undergraduate Advising Office, 2808 BBB Bldg., ugadmin@eecs.umich.edu, (734) 763-6563.
Computer Science in Engineering Program Requirements

1. **Program Core:** All of the following courses are required:
   a. **Computer Science:** EECS 203 (or MATH 465), EECS 280, EECS 281, EECS 370, EECS 376, EECS 496
   b. **Probability and Statistics:** STATS 250 or STATS 412 or STATS 426 or EECS 301 or EECS 401 or IOE 265. Note that IOE 265 is generally open only to undeclared or IOE students.
   c. **Technical Communications:** TCHNCLCM 300

2. **Technical Electives:** A minimum of 26 additional credits of technical electives are required (27 credits if the course used for the CS MDE is 3 credits):
   a. At least 16 of these credits must be in approved Upper Level CS Technical Electives (a list of approved courses can be found later in this document). Students are encouraged to take more than the minimum of 16 credits.
   b. The remainder of the technical elective credits may be chosen from the approved Flexible Technical Electives (a list of approved courses can be found later in this document). These 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 taken during one of your final two semesters. It is comprised of three courses, which must be taken concurrently in the same semester.
   a. A CS MDE design project course: EECS 441 or EECS 467 or EECS 470 or EECS 481 or EECS 494 or EECS 497. If a 3-credit CS MDE course is selected, students need to take a total of 27 credits of Technical Electives. Students who are interested in using a non-CS course for their MDE requirement need to meet with a Faculty Advisor for permission (note: these students will need at least 18 credits of CS coursework among their Technical Electives).
   b. **Computer professionalism:** EECS 496
   c. **Writing and oral presentation:** TCHNCLCM 497 (TCHNCLCM 496 will also be accepted.)

EECS Grading Policy:

**C- Grades.** A grade of C- or below in any of the College Core, Program Core, or Technical Electives is considered a failing grade and the course must be repeated or substituted with another. Exceptions may be discussed with the Chief Program Advisor. [Note: Grades of C- through D- are acceptable for Intellectual Breadth requirements or for Free Electives.]
### (Fall’12-Sum’14) Computer Science - Eng

#### Sample Schedule

<table>
<thead>
<tr>
<th>Subjects Required by all Programs (55 hours)</th>
<th>Credit Hours</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics 115, 116, and 214(^1)</td>
<td>12</td>
<td>4</td>
<td>4</td>
<td>-</td>
<td>4</td>
<td>-</td>
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<tr>
<td>Mathematics 215 or 216(^2)</td>
<td>4</td>
<td>-</td>
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<td>4</td>
<td>-</td>
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<tr>
<td>Engineering 100, Introduction to Engineering</td>
<td>4</td>
<td>-</td>
<td>4</td>
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<tr>
<td>Engineering 101, Introduction to Computers</td>
<td>4</td>
<td>4</td>
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<tr>
<td>Chemistry 125/126 and 130, or Chemistry 210 and 211</td>
<td>5 5</td>
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<tr>
<td>Physics 140 and Lab 141</td>
<td>5</td>
<td>-</td>
<td>5</td>
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<tr>
<td>Physics 240 and Lab 241</td>
<td>5</td>
<td>-</td>
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<td>5</td>
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</tr>
<tr>
<td>Intellectual Breadth</td>
<td>16</td>
<td>4</td>
<td>4</td>
<td>-</td>
<td>4</td>
<td>4</td>
<td>-</td>
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</tbody>
</table>

#### Program Core (24 hours)

| EECS 203 Discrete Mathematics\(^3\)          | 4            | - | - | 4 | - | - | - | - | - |
| EECS 280 Programming and Elementary Data Structures | 4 | - | - | 4 | - | - | - | - | - |
| EECS 281 Data Structures and Algorithms     | 4            | - | - | - | 4 | - | - | - | - |
| EECS 370 Introduction to Computer Architecture | 4 | - | - | - | - | 4 | - | - | - |
| STATS 250 or STATS 412\(^4\)                | 3            | - | - | - | - | 3 | - | - | - |
| EECS 376 Foundations of Computer Science    | 4            | - | - | - | - | - | 4 | - | - |
| TCHNCLCM 300                                | 1            | - | - | - | - | - | - | 1 | - |

#### Major Design Experience (8 hours)

| Approved CS MDE course\(^5\)                | 4            | - | - | - | - | - | - | - | 4 |
| EECS 496 Major Design Experience Professionalism | 2 | - | - | - | - | - | 2 | - | - |
| TCHNCLCM 497                                | 2            | - | - | - | - | - | - | 2 | - |

#### Technical Electives (26 hours)

| Upper Level CS Technical Electives\(^6\)    | 16           | - | - | - | - | - | 4 | 4 | 8 |
| Flexible Technical Electives\(^7\), \(^8\) | 10           | - | - | - | 4 | 4 | - | - | 2 |

#### General Electives (15 hours)

| 15 | - | - | 3 | - | - | 4 | 4 | 4 |

#### Total

| 128 | 17 | 17 | 16 | 16 | 16 | 16 | 16 | 14 |

**Notes:**

- C- Rule: Among science, engineering and mathematics courses, a grade of C- or below is considered unsatisfactory.
- Credits from a course may only be used to fulfill a single requirement (no double counting).
- The requirements for Math 214 can be satisfied by Math 217, 417, or 419.
- If both Math 215 and Math 216 are taken, Math 216 will be counted as a Flexible Technical Elective.
- Math 465 can be used to satisfy this requirement.
- Probability/Statistics Course: STATS 426, EECS 301, EECS 401 and IOE 265 can be used to satisfy this requirement. Stats 250 and IOE 265 are 4 credit courses; if this is elected, the extra credit is counted toward General Electives.
- An Approved Computer Science (CS) Major Design Experience (MDE) course, see the EECS Undergraduate Advising Office for the current list. Must be taken in the same semester as EECS 496 and TCHNCLCM 497. A 3-credit CS MDE course can be used if a total of 27 credits of Technical Electives are elected.
- Upper Level CS Technical Electives (ULCS): Approved Computer Science courses at the 300-level or higher. See the EECS Undergraduate Advising Office for the current list.
- Flexible Technical Electives (FTEs): Approved courses at the 200+ level. ULCS courses can also be used as FTEs. See the EECS Undergraduate Advising Office for the current list.
- A maximum of 4 credits of EECS 499 (or other upper-level directed/independent study) may be applied to Flexible Technical Electives. Anything beyond 4 credits will be applied toward the General Electives.

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**Footnotes:**

\(^1\) The requirements for Math 214 can be satisfied by Math 217, 417, or 419.
\(^2\) If both Math 215 and Math 216 are taken, Math 216 will be counted as a Flexible Technical Elective.
\(^3\) Math 465 can be used to satisfy this requirement.
\(^4\) Probability/Statistics Course: STATS 426, EECS 301, EECS 401 and IOE 265 can be used to satisfy this requirement. Stats 250 and IOE 265 are 4 credit courses; if this is elected, the extra credit is counted toward General Electives.
\(^5\) An Approved Computer Science (CS) Major Design Experience (MDE) course, see the EECS Undergraduate Advising Office for the current list. Must be taken in the same semester as EECS 496 and TCHNCLCM 497. A 3-credit CS MDE course can be used if a total of 27 credits of Technical Electives are elected.
\(^6\) Upper Level CS Technical Electives (ULCS): Approved Computer Science courses at the 300-level or higher. See the EECS Undergraduate Advising Office for the current list.
\(^7\) Flexible Technical Electives (FTEs): Approved courses at the 200+ level. ULCS courses can also be used as FTEs. See the EECS Undergraduate Advising Office for the current list.
\(^8\) A maximum of 4 credits of EECS 499 (or other upper-level directed/independent study) may be applied to Flexible Technical Electives. Anything beyond 4 credits will be applied toward the General Electives.
The following issues have delayed graduation for students. Please be careful.

**Information from Friends.** Your friends can be a very good source of information on certain topics, like the workload in courses they have taken. However, they can be a very unreliable source of information when it comes to 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 departments) can count toward flexible tech electives, e.g., **not** 4 hours from EECS and 4 hours from IOE and 4 hours from Civil. EECS 499 is open **only to seniors;** sophomores and juniors should consider EECS 399 (this counts for general elective credit only).

**TCHNCLCM 300 is a prerequisite for TCHNCLCM 497.** The EECS Advising Office does not give overrides for Technical Communication courses or endorse requests to take these courses concurrently, please direct any questions to that department. (see: http://www.engin.umich.edu/bulletin/tech_comm/index.html)

**Course Sequencing and Workload:**
How many programming classes should I take simultaneously? Most students can handle one or two programming classes together, and some can even do well with three. Here is a current assessment of the programming load in our EECS courses:

- Extremely heavy load: EECS 381, 470
- Heavy load: EECS 281, 482, 483, 487, 489, 494
- Moderate load: EECS 270, 280, 370, 475, 477, 478, 481, 484, 485, 492, 493, 497
- Light load: EECS 203, 285, 376

Rule of thumb: Extreme = 4 points, Heavy = 3 points, Moderate = 2 points, Light = 1 point. Don’t take more than 5 points of programming unless you LOVE to burn the midnight oil every night! Try to save some of your free electives for later semesters to help spread out the workload. For details on how students ranked all EECS classes, visit http://www.eecs.umich.edu/eecs/undergraduate/survey

**What types of classes should I take together?** Try to balance the types of classes you take in a semester: EECS 280, 281, 482, 483, and 489 are all programming classes. EECS 203 and STATS 250/STATS 412 are both math classes. Taking three, or sometimes even two, classes of the same type in the same semester can get very tedious.

**EECS 203 & EECS 280:** Taking EECS 203 (Discrete Structures) [note: MATH 465 is an acceptable alternative] and EECS 280 (Programming) simultaneously often works well, and these are the two prerequisites for the "gateway" course, EECS 281 (Data Structures and 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.

**EECS 489:** This course has a long pre-requisite chain (280, 281, 370, 482). Plan ahead!

**EECS 498:** This is the generic number for "Special Topics" courses. Individual sections may be approved by the Department for Upper Level CS elective credit; otherwise, they usually count as Flexible Technical electives (though not always! some are general elective credit). Requirement information is normally part of the course announcement.
Research & Involvement Opportunities

Majoring in Computer Science at UM provides many exciting opportunities. These include:

**Research: Participate in an Independent Study.**

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 type of research as an undergraduate, which will provide you with extraordinarily valuable training for future work in the field. EECS 499 (independent study) counts as a Flexible Technical Elective (4 cr. max.). It is a great way to get a letter of reference for grad school. If one of your professors is doing work that is interesting to you, approach him or her to discuss this possibility. It is usually most valuable to do a 499 relatively late in your program, when you have acquired knowledge and skills that contribute to the work, and have a clearer picture of what areas you are most interested in. (But keep in mind that most grad school applications are due late December.)

**Teaching: Become an Instructional Aid.**

The discussion sections for EECS 182, EECS 183, EECS 280, and ENGR 100 (CSE-based) 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. If you have done well in your CS courses and have an aptitude for and interest in teaching, you should contact the faculty covering the course.

**Mentoring: Become a Peer Advisor.**

Share your experiences with other undergraduates. If you are interested, check in with the Undergraduate Advising Office. Opportunities are available at the department and college level, as well as with numerous student groups on campus.

**Getting Involved: Join an EECS Student Group**

**CSE Scholars:** CSE Scholars at the University of Michigan is a student society for computer science and engineering students (CS-Eng, CS-LSA, and CE). CSE Scholars seeks to build a challenging and supportive diverse community of scholars. The group is organized into “Working Groups” which perform different functions for the group. The different groups are Program Development, Outreach, Recruiting and Retention, and Peer Advising. More information can be found at [http://www.eecs.umich.edu/~cseschol](http://www.eecs.umich.edu/~cseschol).

**HKN:** Eta Kappa Nu is an honor society for electrical and computer engineering students (including CS-Eng. majors). Members are selected on the basis of scholastic standing, character, and leadership. Eta Kappa Nu aims to help its members become better professionals and citizens and to help improve the standards of the profession, the courses of instruction, and the institutions generally where its chapters are established. More information can be found at [http://hkn.eecs.umich.edu](http://hkn.eecs.umich.edu).

**Getting Experience: Internships, Co-ops, and Job Opportunities**

Many companies hire students for internships upon completion of EECS 280. Since CSE graduates are in great demand, many companies believe in getting potential hires into their company very early.

When looking for that perfect internship, co-op, or permanent job, your first step should always be to check in with the Engineering Career Resource Center (ECRC) to review their list of opportunities. The department forwards all job and internship postings to this office (see: [http://career.engin.umich.edu](http://career.engin.umich.edu)).

The EECS department has excellent connections to multiple local and national companies. Meet with your Faculty Career Mentor to discuss your options! For more information about the Faculty Career Mentor program, see: [http://www.eecs.umich.edu/eecs/undergraduate/employment.html](http://www.eecs.umich.edu/eecs/undergraduate/employment.html).

The January Job Fair is a great place to interview for internships. Again – make sure you register with the Engineering Career Resource Center (ECRC) and see: [http://career.engin.umich.edu](http://career.engin.umich.edu) for more information.

**Mental Health**

If you are feeling stressed, depressed or just need someone to talk to, there are many places to find support on campus. For more information, see: [http://www.rackham.umich.edu/student_life/health_and_wellness/resources/mental_health/](http://www.rackham.umich.edu/student_life/health_and_wellness/resources/mental_health/)
Prerequisite Chain and College Policies

College of Engineering Policies

**Intellectual Breadth** For students matriculated Fall 2011 and after, the following Intellectual Breadth requirements apply (formerly HU/SS). The courses that count toward the Intellectual Breadth requirements are complex and not always intuitive. If you have questions, please contact the EECS Undergraduate Advising Office. See the CoE Bulletin for details. [http://www.engin.umich.edu/college/academics/bulletin/ug-ed/reqs](http://www.engin.umich.edu/college/academics/bulletin/ug-ed/reqs) [Note that Test Credit for Foreign Languages](http://www.engin.umich.edu/college/academics/bulletin/ug-ed/reqs) (AP credits and credits by exam) at the 100-level count only as free electives.

**Dual degrees** To earn a dual degree within Engineering, you must satisfy the requirements for both programs and take at least 14 additional credit hours of technical electives beyond either major (142 credits total). You can double count requirements across degrees, but the 142-credit minimum must be maintained.

**Pass/Fail** is only allowed for intellectual breadth requirements and free electives. You may take pass/fail at most 2 courses 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 during difficult semesters.

**Transfer credit**: The College of Engineering maintains a list of approved transfer courses from many other institutions at [http://www.engin.umich.edu/transferdatabase](http://www.engin.umich.edu/transferdatabase). Courses that do not appear on this list may still transfer but will need to be reviewed. You must take 50 credits hours (including 30 hours of 300-level or above of technical credits) on the Ann Arbor campus.
**Fall’12-Sum’14** Computer Science - Eng

**CS Technical Electives**

You must take at least 18 credits of approved CS Technical Electives. All technical elective credits can be CS Technical Electives, and we encourage students to take more than the minimum. Of the minimum 18 credits in CS Technical Electives, at least 16 credits must be Upper-Level CS (ULCS) Electives; the other 2 credits may be ULCS or Flexible CS Technical Electives. Discuss your elective choices with an EECS faculty in your area of interest or a CS advisor. Courses that have been approved as a CS MDE design project courses are highlighted in **bold** in the lists below.

Note: An EECS course may only count towards 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. Any credits you earn in ULCS courses beyond the minimum 16 will count toward your Flexible CS Technical Electives requirement.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>373</td>
<td>Design of Microprocessor Based Systems</td>
</tr>
<tr>
<td>381</td>
<td>Object-Oriented and Advanced Programming</td>
</tr>
<tr>
<td>388</td>
<td>Introduction to Computer Security</td>
</tr>
<tr>
<td>427</td>
<td>VLSI Design I</td>
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<tr>
<td>442</td>
<td>Computer Vision</td>
</tr>
<tr>
<td>445</td>
<td>Introduction to Machine Learning</td>
</tr>
<tr>
<td>467</td>
<td>Autonomous Robotics</td>
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<tr>
<td>470</td>
<td>Computer Architecture</td>
</tr>
<tr>
<td>475</td>
<td>Introduction to Cryptography</td>
</tr>
<tr>
<td>477</td>
<td>Introduction to Algorithms</td>
</tr>
<tr>
<td>478</td>
<td>Logic Circuit Synthesis and Optimization</td>
</tr>
<tr>
<td>480</td>
<td>Logic and Formal Verification</td>
</tr>
</tbody>
</table>

**Flexible CS Technical Electives**

The following courses are approved as Flexible CS Technical Electives (flexible technical electives in other fields are on the next page). This list includes many courses at the graduate level (numbered 500 and above). Students with interests in research, graduate school, or specific areas should discuss graduate course options with the Chief Program Advisor, who may approve graduate courses on a per-student basis for use as ULCS (approval must be obtained prior to registering for the course).

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>270</td>
<td>Introduction to Logic Design</td>
</tr>
<tr>
<td>285</td>
<td>A Programming Language or Computer System</td>
</tr>
<tr>
<td>382</td>
<td>Internet-Scale Computing</td>
</tr>
<tr>
<td>441</td>
<td>Mobile App Development for Entrepreneurs</td>
</tr>
<tr>
<td>497</td>
<td>EECS Major Design Projects *</td>
</tr>
<tr>
<td>527</td>
<td>Layout Synthesis and Optimization</td>
</tr>
<tr>
<td>543</td>
<td>Knowledge-Based Systems</td>
</tr>
<tr>
<td>545</td>
<td>Machine Learning</td>
</tr>
<tr>
<td>547</td>
<td>Electronic Commerce</td>
</tr>
<tr>
<td>567</td>
<td>Introduction to Robotics</td>
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<tr>
<td>570</td>
<td>Parallel Computer Architecture</td>
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<tr>
<td>571</td>
<td>Principles of Real Time Computing</td>
</tr>
<tr>
<td>573</td>
<td>Microarchitecture</td>
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<tr>
<td>574</td>
<td>Computational Complexity</td>
</tr>
<tr>
<td>575</td>
<td>Advanced Cryptography</td>
</tr>
<tr>
<td>578</td>
<td>CAD Verification of Digital Systems</td>
</tr>
<tr>
<td>581</td>
<td>Software Engineering</td>
</tr>
<tr>
<td>582</td>
<td>Advanced Operating Systems</td>
</tr>
<tr>
<td>583</td>
<td>Advanced Compilers</td>
</tr>
<tr>
<td>584</td>
<td>Advanced Database Systems</td>
</tr>
<tr>
<td>586</td>
<td>Design and Analysis of Algorithms</td>
</tr>
<tr>
<td>587</td>
<td>Parallel Computing</td>
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<tr>
<td>588</td>
<td>Computer and Network Security</td>
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<tr>
<td>589</td>
<td>Advanced Computer Networks</td>
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<tr>
<td>590</td>
<td>Advanced Programming Languages</td>
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<tr>
<td>591</td>
<td>Distributed Systems</td>
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<tr>
<td>592</td>
<td>Advanced Artificial Intelligence</td>
</tr>
<tr>
<td>593</td>
<td>User Interface Development</td>
</tr>
<tr>
<td>594</td>
<td>Introduction to Adaptive Systems</td>
</tr>
<tr>
<td>595</td>
<td>Natural Language Processing</td>
</tr>
</tbody>
</table>

*EECS 497:* Beginning Fall 2013, this course will count only as a CS Flex Tech, it will no longer count as ULCS.

**Note:** EECS 398, 498, and 598 are the generic numbers for "Special Topics" courses. Individual sections may be approved for Upper Level CS elective credit or Flexible Technical elective credit. Whether the course is approved for ULCS and/or Flex Tech credit is normally part of the course announcement. See the Undergraduate Advising Office with questions about particular offerings.

**Elective Groups**

The CS programs have no official specializations, but we often advise students to consider the following groups of electives depending on their career interests. Some courses appear in more than one group; these are good choices if you aren’t yet certain what area of computing you are most interested in.

- **Computer hardware:** 270, 373, 470, 478
- **Computing infrastructure:** 482, 483, 484, 489
- **Intelligent systems:** 442, 492, 543
- **Software development:** 381, 481, 482, 484, 493, 494
- **Theory of computation:** 475, 477, 480
- **Web technology and applications:** 285, 382, 475, 484, 485
(Fall’12-Sum’14) Computer Science - Eng

Flexible Technical Electives

Listed below are some courses that meet the Flexible Technical Elective requirement for CS-Eng, CS-LSA, and CE. Other courses (including special topics courses, such as EECS 398 and 498) may be approved by the Curriculum Committees on a term-by-term basis. Please see the Undergraduate Advising Office with questions.

Directed/Independent Study Rule: At most 4 credits count toward the Technical Electives requirement. This applies to all independent/directed study or research courses (including those from other departments). Any additional credits count toward free electives.

Aerospace Engineering
- 215 Introduction to Solid Mechanics and Aerospace Structures
- 225 Introduction to Gas Dynamics
- 245 Performance of Aircraft and Spacecraft

Any AEROSP course at the 300-level or higher [AEROSP 390 & 490: see Directed Study Rule above.]

Atmospheric, Oceanic and Space Sciences
Any AOSS course at the 300-level or higher [AOSS 499: see Directed Study Rule above.]

Biology
- 305 Genetics

Any BIOLOGY course at the 400-level or higher

Biomedical Engineering
- 221 Biophysical Chemistry and Thermodynamics
- 231 Introduction to Biomechanics

Any BIOMEDE course at the 300-level or higher [BIOMEDE 490: see Directed Study Rule above.]

Chemical Engineering
- 230 Material and Energy Balances

Any CHE course at the 300-level or higher [except CHE 405, CHE 490: see Directed Study Rule above.]

Chemistry
- 210 Structure and Reactivity I
- 211 Investigations in Chemistry
- 215 Structure and Reactivity II
- 216 Synthesis and Characterization of Organic Compounds
- 230 Physical Chemical Principles and Applications
- 241 Introduction to Chemical Analysis
- 242 Introduction to Chemical Analysis Laboratory
- 260 Chemical Principles
- 265 Sustainable Engineering Principles

Any CHEM course at the 300-level or higher [CHEM 398, 399, 498, & 499: see Directed Study Rule above.]

Civil and Environmental Engineering
- 211 Statics and Dynamics
- 212 Solid and Structural Mechanics
- 230 Energy and Environment
- 450 Multidisciplinary Design [See Directed Study Rule above.]
- 455 Multidisciplinary Design II [See Directed Study Rule above.]
- 480 Global Synthesis Project (Tauber Institute)

Complex Systems
- 270 Agent Based Modeling

Economics
- 406 Introduction to Econometrics
- 409 Game Theory

Electrical Engineering and Computer Science
- 215 Introduction to Electronic Circuits
- 216 Introduction to Signals and Systems
- 230 Electromagnetics I
- 250 Electronic Sensing Systems
- 270 Introduction to Logic Design
- 285 A Programming Language or Computer System
- 298*, 399, 402, 406, 410, and 498* [EECS 499: see Directed Study Rule above.]

Any EECS course at the 300-level or higher (except 398*, 399, 402, 406, 410, and 498*) [EECS 499: see Directed Study Rule above.] *each special topics course is reviewed for possible FTE/ULCS credit for the term/topic offered, see the Advising Office for details

Engineering
- 350 Internat.'l Lab. Experience for Engineers
- 355 Multidisciplinary Design I [See Directed Study Rule above.]
- 403 Scientific Visualization
- 450 Multidisciplinary Design [See Directed Study Rule above.]
- 455 Multidisciplinary Design II [See Directed Study Rule above.]
- 480 Global Synthesis Project (Tauber Institute)
### Industrial and Operations Engineering
- 202 Operations Modeling
- Any IOE course at the 300-level or higher (except 373 & 422) [IOE 490: see Directed Study Rule above.]

### Linguistics
- 442 Computational Linguistics II

### Materials Science and Engineering
- 220 Introduction to Materials and Manufacturing
- 242 Physics of Materials
- 250 Principles of Engineering Materials
- Any MATSCIE course at the 300-level or higher [MATSCIE 490: see Directed Study Rule above.]

### Mathematics
- 215 Calculus III (if not used for CoE Math core)
- 216 Introduction to Differential Equations (if not used for CoE Math core)
- Any MATH course at the 300-level or higher (except 310, 327, 333, 385, 389, 399, 417, 419, 422, 429, 431, 485, 486, 489, 497)

### Mechanical Engineering
- 211 Introduction to Solid Mechanics
- 235 Thermodynamics
- 240 Introduction to Dynamics and Vibrations
- 250 Design and Manufacturing I
- Any MECHENG course at the 300-level or higher [MECHENG 490 & 491: see Directed Study Rule above.]

### Molecular, Cellular, and Developmental Biology (MCBD)
- 306 Introductory Genetics Laboratory
- 310 Introductory Biochemistry

### Naval Architecture and Marine Engineering
- 260 Marine Systems Manufacturing
- 270 Marine Design
- Any NAVARCH course at the 300-level or higher [NAVARCH 490: see Directed Study Rule above.]

### Nuclear Engineering and Radiological Sciences
- 250 Fundamentals of Nuclear Engineering and Radiological Sciences
- Any NERS course at the 300-level or higher [NERS 499: see Directed Study Rule above.]

### Operations & Management Science
- 605 Manufacturing and Supply Operations

### Performing Arts Technology
- 452 Interactive Media Design II
- 462 Digital Sound Synthesis II

### Physics
- 240 General Physics II (CS-LSA only)
- 241 Elementary Laboratory II (CS-LSA only)
- Any PHYSICS course at the 300-level or higher (except 333, 334, 420, and 481) [PHYS 496, 497 498, 499: see Directed Study Rule above.]

### School of Information
- 301 Models of Social Information Processing
- 422 Evaluation of Systems and Services

### Statistics
- 401 Applied Statistical Methods II
- 403 Introduction to Quantitative Research Methods
- 406 Introduction to Statistical Computing
- 415 Data Mining and Statistical Learning
- 425 Introduction to Probability (cross-listed with MATH 425, cannot be double-counted with CE Program Core)
- 426 Introduction to Theoretical Statistics
- 430 Applied Probability
- 470 Introduction to the Design of Experiments
- 531 Analysis of Time Series
### Unofficial CoE Student Advising Form - CS Engin
For advising only; NOT official audit. Students – consult with your advisor to confirm course selections satisfy degree requirements.

#### Last Name: ______________________  First Name: ______________________  Emplid: __________  Unique ID: __________  GPA: ________  CTP: ________  Elected Hrs: ________

<table>
<thead>
<tr>
<th>Req Term: FA12</th>
<th>Minor(s): __________</th>
<th>Honor(s): __________</th>
<th>Dual: __________</th>
<th>Subplan: __________</th>
<th>As of: __________</th>
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#### Common Requirements (CoE)

<table>
<thead>
<tr>
<th>Units Required: 36-39</th>
<th>Units (In Progress and Earned): __________</th>
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<tbody>
<tr>
<td>Math115</td>
<td>Engr100</td>
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<tr>
<td>Math116</td>
<td>Engr101</td>
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<tr>
<td>Math212</td>
<td>Chem 125/126 or 211</td>
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<tr>
<td>Math215/216</td>
<td>Math Tot; Chem Earned; __________</td>
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</table>

- 50 units minimum residency taken at UM-AA campus Phys Tot: __________
- 30 units 300 or higher tech courses taken at UM-AA while enrolled in CoE

### Program Subjects (Prog)

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<thead>
<tr>
<th>Category</th>
<th>Subject</th>
<th>Nbr</th>
<th>Sectn</th>
<th>Units</th>
<th>Term</th>
<th>Grade</th>
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#### Major Design Experience (MDE)

- EECS 441*, 470, 481, 494, or 497 (if 441 taken, need 11 flex tech)

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<th>Category</th>
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<th>Units</th>
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#### Intellectual Breadth

- Units Req: 16 (or longer)
- 3 Units HU
- PCDC Units Earned: __________

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<th>Category</th>
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#### Upper Level CS Technical Electives (ULCS)

- Units Required: 10 (or longer)

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<th>Category</th>
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<th>Units</th>
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#### General Electives (General)

- Units Required: 15 (or longer)

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#### Flexible Technical Electives (FlexTech)

- Units Required: 10 (or longer)

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<th>Category</th>
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<th>Units</th>
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#### Total Earned MDE + ULCS TE + Flex Tech

<table>
<thead>
<tr>
<th>Units Required: 30</th>
<th>Units Earned: 0</th>
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#### Courses not eligible or not used for credit (NFC)

<table>
<thead>
<tr>
<th>Category</th>
<th>Subject</th>
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Advisor: ______________________  Date: ______________________