



(2004-) Winter'2012 Computer Science Program - Engineering

Electrical Engineering & Computer Science Department
Undergraduate Advising Office
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Welcome!

Thank you for your interest in the EECS Department's Computer Science program. 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: game design, medicine, computer graphics, security, business management, consulting, software engineering, 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 Wii?) 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, 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 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 an 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 student services coordinator or the CS-Eng chief program advisor at csengadvisor@umich.edu.

This document covers rules and advice for the CS-Eng program for Fall 2004 to Winter 2012 academic years. 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 2004, you may be covered by a different set of rules.

THIS DOCUMENT DESCRIBES THE COMPUTER SCIENCE PROGRAM REQUIREMENTS FOR STUDENTS IN THE COLLEGE OF ENGINEERING

EECS offers two paths to an undergraduate degree in Computer Science: one for students in the LS&A College (CS-LSA) and another for students in the College of Engineering (CS-Eng). For more information, please see http://www.eecs.umich.edu/eecs/undergraduate/cs_lsa_vs_engr.html

(2004-) 2012 Computer Science Program - Engineering Program Requirements & Grade Policy

Computer Science in Engineering Program Requirements

1. **Program Core Courses:** 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 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 30 additional credits of technical electives are required:
 - a. At least 16 of the 30 credits must be in approved *Upper Level CS Technical Electives* (a list of approved courses can be found later in this document). All 30 elective credits can be Upper Level electives, and students are encouraged to take more than the minimum of 16.
 - b. The remainder of the 30 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.
 - c. At least 18 of the 30 technical elective credits must be in CS courses at 200-level and above. This means that if the student takes the minimum number of Upper Level CS Technical Electives, at least 2 credits of the Flexible Technical Electives must be in CS courses.
3. **Major Design Experience (MDE):** The MDE is a capstone design project taken during one of your final two terms. It is comprised of three courses, which should be taken concurrently.
 - a. MDE design project course: EECS 441 or EECS 467 or EECS 470 or EECS 473 or EECS 481 or EECS 494 or EECS 497. These courses also satisfy part of the credit requirement for Upper Level CS Technical Electives or Flexible Technical Elective (depending on the course, check with an Advisor). You may also use ENGR 450, ENGR 480, or an MDE project course from another major as your MDE design project course.
 - 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 Intellectual Breadth requirements or for Free Electives.]

(2004-) 2012 Computer Science Program - Engineering

Sample Schedule

	Total Credit Hours	Terms:							
		1	2	3	4	5	6	7	8
Subjects Required by all Programs (55 hours)									
Mathematics 115, 116, and 216	12	4	4	-	4	-	-	-	-
Mathematics 215	4	-	-	-	-	4	-	-	-
Engineering 100, Introduction to Engineering	4	-	4	-	-	-	-	-	-
Engineering 101, Introduction to Computers	4	4	-	-	-	-	-	-	-
Chemistry 125/126 and 130 or Chemistry 210 and 211 ¹	5	5	-	-	-	-	-	-	-
Physics 140 with Lab 141 ²	5	-	5	-	-	-	-	-	-
Physics 240 with Lab 241 ²	5	-	-	5	-	-	-	-	-
Intellectual Breadth	16	4	4	-	4	4	-	-	-
Program Subjects (28 hours)									
EECS 203 ³ , Discrete Mathematics	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 or STATS 426 or IOE 265 ⁴	3	-	-	-	-	-	3	-	-
EECS 376, Foundations of Computer Science	4	-	-	-	-	-	4	-	-
EECS 496, Major Design Experience Professionalism	2	-	-	-	-	-	-	2	-
TCHCLCM 300 ⁵	1	-	-	-	-	-	1	-	-
TCHCLCM 497 ⁵	2	-	-	-	-	-	-	2	-
Technical Electives (30 hours)									
Flexible Technical Electives ⁶	14	-	-	-	4	4	-	-	6
Upper Level CS Technical Electives ⁷	16	-	-	-	-	-	4	8	4
Unrestricted Electives	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.

¹ If you have a satisfactory score or grade in Chemistry AP, A-Level, IB Exams or transfer credit from another institution for Chemistry 130/125/126 you will have met the Chemistry Core Requirement for the College of Engineering. Students who qualify are encouraged to take CHEM 210 (4 hours) & CHEM 211 (1 hour) as a replacement for CHEM 130 (3 hours), CHEM 125 (1 hour), and CHEM 126 (1 hour).

² If you have a satisfactory score or grade in Physics AP, A-Level, IB Exams or transfer credit from another institution for Physics 140/141 and 240/241 you will have met the Physics Core Requirement for the College of Engineering.

³ MATH 465 is an acceptable alternative to EECS 203

⁴ Probability/Statistics Course: STATS 250 and IOE 265 are 4 credit courses; if one of these is elected, the extra credit is counted toward free electives. Note that IOE 265 is often open only to undeclared or IOE students (see the IOE department with questions about enrollment restrictions).

⁵ Technical Communication: TCHNCLCM 300 can be taken independently of any EECS course, but it is a prerequisite for TCHNCLCM 497. TCHNCLCM 497 must be taken with a major design experience (MDE) course and EECS 496.

⁶ Flexible Technical Electives (FTEs): Approved courses at the 200+ level. Upper Level CS Technical Electives can also be used as FTEs. See the EECS Undergraduate Advising Office for the current list. At least 2 credits in CS are required. **Note:** 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 Free Electives.

⁷ Upper Level CS Technical Electives: Approved Computer Science courses at the 300-level or higher. See the Undergraduate Advising Office for the current list.

(2004-) 2012 Computer Science Programs

General Advice

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 373, 381, 467, 470, 482
- Heavy load: EECS 281, 442, 445, 477, 483, 485, 494
- Moderate load: EECS 270, 280, 370, 388, 475, 478, 481, 484, 487, 489, 492, 493, 497
- Light load: EECS 183, 203, 285, 376, 441

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 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.

(2004-) 2012 Computer Science & Computer Engineering Programs 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>

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>

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>).

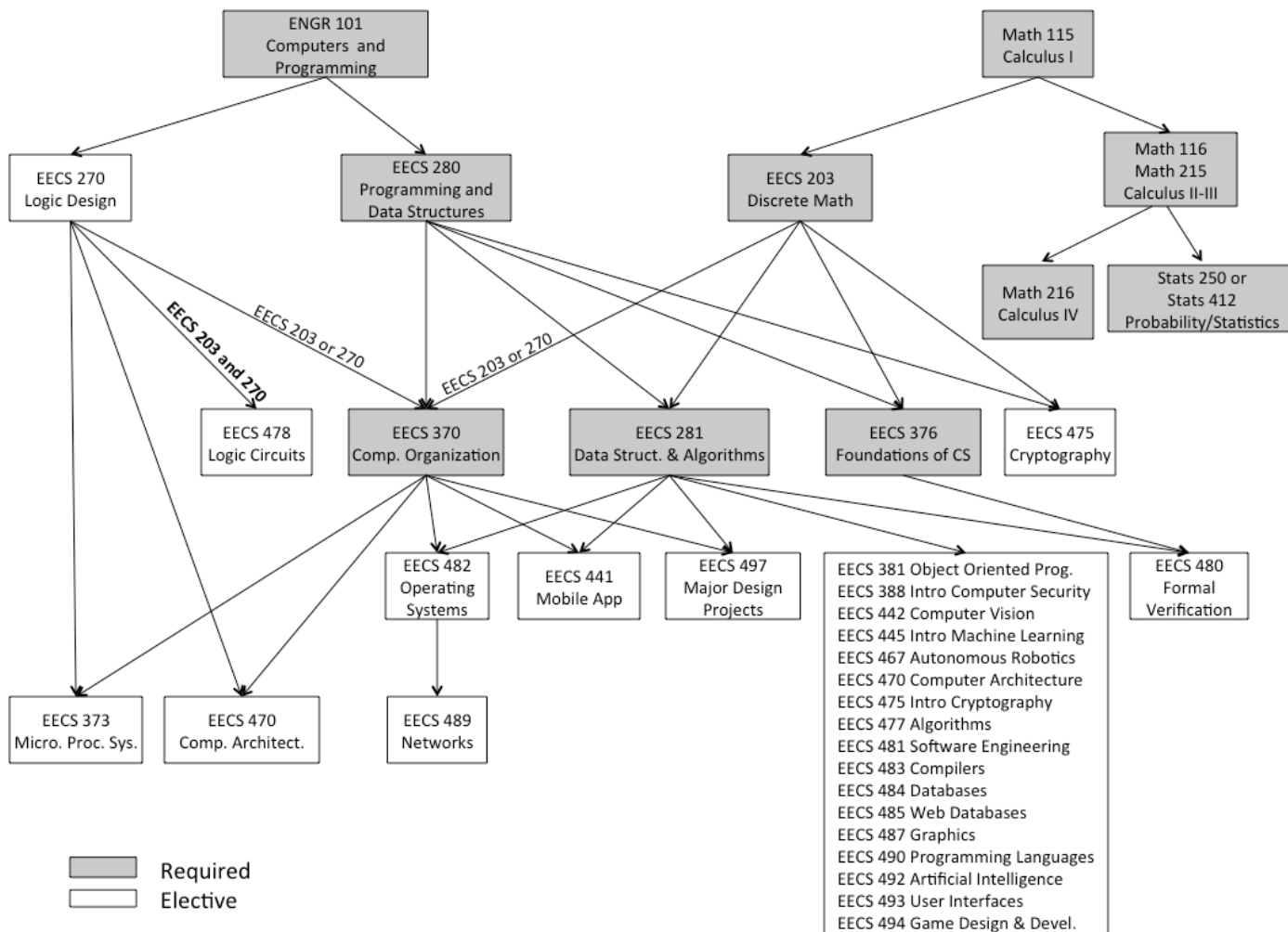
The EECS department has excellent connections to multiple local and national companies. Meet with your Faculty Career Mentor to discuss your options! For more information about the Faculty Career Mentor program, see: <http://www.eecs.umich.edu/eecs/undergraduate/employment.html>

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> 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/

(2004-) 2012 Computer Science Programs 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#intellectualbreadth>. [Note that **Test Credit for Foreign Languages** (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>. 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.*

(2004-) 2012 Computer Science Programs

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 MDE design project courses are highlighted in **bold** in the lists below.

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.

373	Design of Microprocessor Based Systems	481	Software Engineering
381	Object-Oriented and Advanced Programming	482	Introduction to Operating Systems
388	Introduction to Computer Security	483	Compiler Construction
427	VLSI Design I	484	Database Management Systems
442	Computer Vision	485	Web Database and Information Systems
445	Introduction to Machine Learning	487	Interactive Computer Graphics
467	Autonomous Robotics	489	Computer Networks
470	Computer Architecture	490	Programming Languages
475	Introduction to Cryptography	492	Introduction to Artificial Intelligence
477	Introduction to Algorithms	493	User Interface Development
478	Logic Circuit Synthesis and Optimization	494	Computer Game Design and Development
480	Logic and Formal Verification		

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).

270	Introduction to Logic Design	578	CAD Verification of Digital Systems
285	A Programming Language or Computer System	579	Digital System Testing
382	Internet-Scale Computing	580	Advanced Computer Graphics
441	Mobile App Development for Entrepreneurs	581	Software Engineering Tools
473	Advanced Embedded Systems	582	Advanced Operating Systems
497	EECS Major Design Projects*	583	Advanced Compilers
527	Layout Synthesis and Optimization	584	Advanced Database Systems
543	Knowledge-Based Systems	586	Design and Analysis of Algorithms
545	Machine Learning	587	Parallel Computing
547	Electronic Commerce	588	Computer and Network Security
567	Introduction to Robotics	589	Advanced Computer Networks
570	Parallel Computer Architecture	590	Advanced Programming Languages
571	Principles of Real Time Computing	591	Distributed Systems
573	Microarchitecture	592	Advanced Artificial Intelligence
574	Computational Complexity	594	Introduction to Adaptive Systems
575	Advanced Cryptography	595	Natural Language Processing

* **EECS 497**: Beginning Fall 2013, this course will no longer count as ULCS. Students who take this course prior to Fall 2013 may count it as a ULCS. This change does not affect the status of EECS 497 as an MDE course; EECS 497 will still count toward the MDE requirement, if EECS 496 and TCHNCLCM 497 are taken with it.

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

(2004-) 2012 Computer Science & Computer Engineering Programs

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 Flexible Technical Elective 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

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|-----|--|---|
| 215 | Introduction to Solid Mechanics and Aerospace Structures | Any AEROSP course at the 300-level or higher [AEROSP 390 & 490: see Directed Study Rule above.] |
| 225 | Introduction to Gas Dynamics | |
| 245 | Performance of Aircraft and Spacecraft | |

Atmospheric, Oceanic and Space Sciences

Any AOSS course at the 300-level or higher [AOSS 499: see Directed Study Rule above.]

Biology

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|-----|----------|---|
| 305 | Genetics | Any BIOLOGY course at the 400-level or higher |
|-----|----------|---|

Biomedical Engineering

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|-----|--|---|
| 221 | Biophysical Chemistry and Thermodynamics | Any BIOMEDE course at the 300-level or higher |
| 231 | Introduction to Biomechanics | [BIOMEDE 490: see Directed Study Rule above.] |

Chemical Engineering

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|-----|------------------------------|---|
| 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

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|-----|---|--|
| 210 | Structure and Reactivity I | 241 Introduction to Chemical Analysis |
| 211 | Investigations in Chemistry | 242 Introduction to Chemical Analysis Laboratory |
| 215 | Structure and Reactivity II | 260 Chemical Principles |
| 216 | Synthesis and Characterization of Organic Compounds | Any CHEM course at the 300-level or higher [CHEM 398, 399, 498, & 499: see Directed Study Rule above.] |
| 230 | Physical Chemical Principles and Applications | |

Civil and Environmental Engineering

- | | | |
|-----|--------------------------------|--|
| 211 | Statics and Dynamics | 265 Sustainable Engineering Principles |
| 212 | Solid and Structural Mechanics | Any CEE course at the 300-level or higher (except 303) |
| 230 | Energy and Environment | [CEE 490: see Directed Study Rule above.] |

Complex Systems

- | | | |
|-----|----------------------|--|
| 270 | Agent Based Modeling | |
|-----|----------------------|--|

Economics

- | | | |
|-----|---|----------------------------------|
| 401 | Intermediate Microeconomic Theory (last term as a Flex Tech is Fall'13) | 406 Introduction to Econometrics |
| 402 | Intermediate Macroeconomic Theory (last term as a Flex Tech is Fall'13) | 409 Game Theory |

Electrical Engineering and Computer Science

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|-----|---|--|
| 215 | Introduction to Electronic Circuits | Any EECS course at the 300-level or higher (<i>except</i> 398*, 402, 406, 410, and 498*) [EECS 399 (FA'14 or later / 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 |
| 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 | |

Engineering

- | | | | |
|-----|---|-----|--|
| 350 | Internat.'l Lab. Experience for Engineers | 450 | Multidisciplinary Design [see Directed Study Rule above.] |
| 355 | Multidisciplinary Design I [see Directed Study Rule above.] | 455 | Multidisciplinary Design II [see Directed Study Rule above.] |
| 403 | Scientific Visualization | 480 | Global Synthesis Project (Tauber Institute) |

Industrial and Operations Engineering

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|-----|--|--|
| 201 | Economic Decision Making (last term as a Flex Tech is Fall'12) | Any IOE course at the 300-level or higher (<i>except</i> 373 & 422) [IOE 490: see Directed Study Rule above.] |
| 202 | Operations Modeling | |

Linguistics

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|-----|---|-----|------------------------------|
| 441 | Computational Linguistics I (last term as a Flex Tech is Winter'12) | 442 | Computational Linguistics II |
|-----|---|-----|------------------------------|

Materials Science and Engineering

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

Mathematics

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|-----|--|---|
| 214 | Linear Algebra and Differential Equations | Any MATH course at the 300-level or higher (<i>except</i> 310, 327, 333, 385, 389, 399, 422, 429, 431, 485, 486, 489, 497) |
| 216 | Introduction to Differential Equations (CS-LSA only) | |
| 217 | Linear Algebra | |

Mechanical Engineering

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

Molecular, Cellular, and Developmental Biology (MCBD)

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|-----|----------------------------------|-----|---------------------------|
| 306 | Introductory Genetics Laboratory | 310 | Introductory Biochemistry |
|-----|----------------------------------|-----|---------------------------|

Naval Architecture and Marine Engineering

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

Nuclear Engineering and Radiological Sciences

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|-----|---|---|---|
| 211 | Introduction to Nuclear Engineering and Radiological Sciences (last term as a Flex Tech is Fall'12) | 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

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|-----|-------------------------------------|
| 605 | Manufacturing and Supply Operations |
|-----|-------------------------------------|

Performing Arts Technology

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|-----|---|-----|-------------------------|
| 452 | Interactive Music Design II (Computer Music Programming II) | 462 | Digital Sound Synthesis |
|-----|---|-----|-------------------------|

Physics

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

School of Information

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|-----|---|-----|------------------------------------|
| 301 | Models of Social Information Processing | 422 | Evaluation of Systems and Services |
| 364 | Building Interactive Applications | | |

Statistics

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|-----|---|-----|---|
| 401 | Applied Statistical Methods II | 426 | Introduction to Theoretical Statistics |
| 403 | Introduction to Quantitative Research Methods | 430 | Applied Probability |
| 406 | Introduction to Statistical Computing | 470 | Introduction to the Design of Experiments |
| 415 | Data Mining and Statistical Learning | 531 | Analysis of Time Series |
| 425 | Introduction to Probability (cross-listed with MATH 425, cannot be double-counted with CE Program Core) | | |

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: _____
 Req Term: _____ Minor(s): _____ Honor(s): _____ Dual: _____ Subplan: _____ As of: _____

Common Requirements (CoE)

Units Required: 36-39 Units (In Progress and Earned): 16

<input type="checkbox"/> Math115	<input type="checkbox"/> Engr100	<input type="checkbox"/> Chem 130 or 210	<input type="checkbox"/> Physics140
<input type="checkbox"/> Math116	<input type="checkbox"/> Engr101	<input type="checkbox"/> Chem 125/126 or 211	<input type="checkbox"/> Physics141
<input type="checkbox"/> Math215			<input type="checkbox"/> Physics240
<input type="checkbox"/> Math216			<input type="checkbox"/> Physics241

50 units minimum residency taken at UM-AA campus

Category	Subject	Nbr	Sctn	Units	Term	Grade Note

Program Subjects (Prog)

Units Required: 28. Units Earned: _____ Dept GPA: _____

<input type="checkbox"/> EECS203	<input type="checkbox"/> EECS370	<input type="checkbox"/> STATS412/IOE265
<input type="checkbox"/> EECS280	<input type="checkbox"/> EECS376	<input type="checkbox"/> TCom300
<input type="checkbox"/> EECS281	<input type="checkbox"/> EECS496	<input type="checkbox"/> TCom497

30 units 300 or higher tech courses taken at UM-AA while enrolled in CoE

Category	Subject	Nbr	Sctn	Units	Term	Grade Note

Major Design Experience (MDE)

1 Course Required

Category	Subject	Nbr	Sctn	Units	Term	Grade Note

Intellectual Breadth

Units Required: 16. Units Earned: _____ 3 Units 300-Level (UpLvl)

3 Units HU PCDC Units Earned: _____ (Max 4 Units Allowed)

Category	Subject	Nbr	Sctn	Units	Term	Grade Note

Upper Level CS Technical Electives (UI CS)

Units Required: 16. Units Earned: _____

Category	Subject	Nbr	Sctn	Units	Term	Grade Note

General Electives (General)

Units Required: 15. Units Earned: _____ 128 Credits Toward Prog Req

Category	Subject	Nbr	Sctn	Units	Term	Grade Note

Flexible Technical Electives (FlexTech)

Units Required: 14. Units Earned: _____ 18 CS Units

Category	Subject	Nbr	Sctn	Units	Term	Grade Note

Courses not eligible or not used for credit (NEC)

Category	Subject	Nbr	Sctn	Units	Term	Grade Note

Advisor: _____ Date: _____