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. 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:

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 Faculty 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 EECS Advising web page 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.

Computer Science Undergraduate Advising Office, 2808 BBB Bldg., ugadmin@eecs.umich.edu, (734) 763-6563.
EECS Undergraduate Program website: http://www.eecs.umich.edu/eecs/undergraduate.

This document covers rules and advice for the CS-Eng program for Fall 2012 – Summer 2017. 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.

THIS CS-ENG GUIDE APPLIES ONLY TO COLLEGE OF ENGINEERING STUDENTS.

EECS offers two paths to an undergraduate degree in Computer Science: one for students in the College of Literature, Science & the Arts (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
College of Engineering Core Requirements

1. Engineering 100, and {Engineering 101 or Engineering 151}
2. Chemistry 125, Chemistry 126, Chemistry 130 or Chemistry 210, Chemistry 211
3. Physics 140, Physics 141, Physics 240, 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 or Math 419)
   d. Math 215 or Math 216 (If both Math 215 and Math 216 are taken, Math 216 will be counted as a Flexible Technical Elective.)
5. Intellectual Breadth: 16 credits to include 3 credits of Humanities/“HU” and 3 credits of Upper-level (300+). These two requirements can overlap. The 16 credits cannot include more than 4 credits of PCDC (Professional & Creative Development) courses.
6. General Electives: 15 credits are required.

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, 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. Dual major/dual degree students, see dual majors document (2808 BBB) for possible substitutions.
   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 & Repeat Policies

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. [Note: Grades of C- through D- are acceptable for Intellectual Breadth requirements or for Free 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 your U-M transcript. At most one attempt from Summer 2014 and earlier will count against this limit. Exceptions to this rule can be granted by the CS-Engineering Chief Program Advisor only in extraordinary circumstances.
**EECS 441 and EECS 497 also require successful completion of at least 4 credits of ULCS prior to electing one of these courses.**

**College of Engineering Policies**

**Intellectual Breadth:** 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 (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 pertinent 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 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 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 2012–Summer 2017) Computer Science–Eng  
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. Keep in mind that the following plan is only a sample; students must respect prerequisite chains, but it is not necessary to follow the below plan exactly. For more planning assistance, students should schedule an appointment with a Faculty Advisor on the EECS Undergraduate website.

<table>
<thead>
<tr>
<th>Subjects Required by all Programs (55 hours)</th>
<th>Terms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics 115, 116, and 214¹</td>
<td>12</td>
</tr>
<tr>
<td>Mathematics 215 or 216²</td>
<td>4</td>
</tr>
<tr>
<td>Engineering 100, Introduction to Engineering</td>
<td>4</td>
</tr>
<tr>
<td>Engineering 101, Introduction to Computers</td>
<td>4</td>
</tr>
<tr>
<td>Chemistry 125/126 and 130 or Chemistry 210 and 211</td>
<td>5</td>
</tr>
<tr>
<td>Physics 140 and Lab 141</td>
<td>5</td>
</tr>
<tr>
<td>Physics 240 and Lab 241</td>
<td>5</td>
</tr>
<tr>
<td>Intellectual Breadth</td>
<td>16</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Program Subjects (24 hours)</th>
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</tr>
</thead>
<tbody>
<tr>
<td>EECS 203 Discrete Mathematics (or MATH 465)</td>
<td>4</td>
</tr>
<tr>
<td>EECS 280, Programming and Elementary Data Structures</td>
<td>4</td>
</tr>
<tr>
<td>EECS 281, Data Structures and Algorithms</td>
<td>4</td>
</tr>
<tr>
<td>EECS 370, Introduction to Computer Architecture</td>
<td>4</td>
</tr>
<tr>
<td>STATS 250 or STATS 280 or STATS 412 or STATS 426 or EECS 301/401 or IOE 265³</td>
<td>3</td>
</tr>
<tr>
<td>EECS 376, Foundations of Computer Science</td>
<td>4</td>
</tr>
<tr>
<td>TCHNCLCM 300</td>
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<table>
<thead>
<tr>
<th>Major Design Experience (8 hours)</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Approved CS MDE course¹</td>
<td>4</td>
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<tr>
<td>EECS 496 Major Design Experience Professionalism</td>
<td>2</td>
</tr>
<tr>
<td>TCHNCLCM 497</td>
<td>2</td>
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</table>

<table>
<thead>
<tr>
<th>Technical Electives (26 hours)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper Level CS Technical Electives⁵</td>
<td>16</td>
</tr>
<tr>
<td>Flexible Technical Electives⁵,⁶</td>
<td>10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>General Electives (15 hours)</th>
<th></th>
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<tbody>
<tr>
<td></td>
<td>15</td>
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</tbody>
</table>

| Total Credits                               | 128   |

<table>
<thead>
<tr>
<th>Terms</th>
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<tbody>
<tr>
<td>1</td>
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<td>7</td>
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<tr>
<td>8</td>
</tr>
</tbody>
</table>

Notes:
- **C- Rule:** Among all requirements listed above (with the exception of General Electives and Intellectual Breadth), a grade of C- or below is considered unsatisfactory. C or higher is required.
- 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, or 419.
2. If both MATH 215 and MATH 216 are taken, MATH 216 will be counted as a Flexible Technical Elective.
3. STATS 250, STATS 280, EECS 301, and IOE 265 are 4 credit courses; if one of these is elected, the extra credit is counted toward General Electives.
4. See the appropriate CS Program Guide for the current list. Must be taken in the same semester as EECS 496 and TCHNCLCM 497. If a 3-credit MDE is selected, an additional technical credit must be taken; see a Faculty Advisor for help.
5. See the appropriate CS Program Guide for the current list.
6. 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.
(Fall 2012–Summer 2017) Computer Science–Eng
CS-Eng 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 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.

373 Design of Microprocessor Based Systems 482 Introduction to Operating Systems
381 Object-Oriented and Advanced Programming 483 Compiler Construction
388 Introduction to Computer Security 484 Database Management Systems
427 VLSI Design I 485 Web Database and Information Systems
442 Computer Vision 486 Information Retrieval & Web Search
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

Flexible CS Technical Electives
The following courses are approved as Flexible CS Technical Electives (Flex Techs in other fields are listed online at eecs.umich.edu/eecs/undergraduate/computer-science). This list includes courses at the graduate level (numbered 500 and above). Students with interests in research, graduate school, or specific areas should discuss elective courses 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 575 Advanced Cryptography
285 A Programming Language or Computer System 578 CAD Verification of Digital Systems
382 Internet-Scale Computing 579 Digital System Testing
441 Mobile App Development for Entrepreneurs 580 Advanced Computer Graphics
473 Advanced Embedded Systems 581 Software Engineering Tools
481 Software Engineering* 582 Advanced Operating Systems
494 Computer Game Design and Development* 583 Advanced Compilers
497 EECS Major Design Projects 584 Advanced Database Systems
527 Layout Synthesis and Optimization 586 Design and Analysis of Algorithms
543 Knowledge-Based Systems 587 Parallel Computing
545 Machine Learning 588 Computer and Network Security
547 Electronic Commerce 589 Advanced Computer Networks
567 Introduction to Robotics 590 Advanced Programming Languages
570 Parallel Computer Architecture 591 Distributed Systems
571 Principles of Real Time Computing 592 Advanced Artificial Intelligence
573 Microarchitecture 594 Introduction to Adaptive Systems
574 Computational Complexity 595 Natural Language Processing

*EECS 481 and 494 may be used as ULCS credit if taken in Winter 2017 or before.

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. Approvals for ULCS and/or Flex Tech are listed online every term at eecs.umich.edu/eecs/academics/special_topics.html.

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, here are some groups of electives that you may want to take.

Computer hardware: 270, 373, 470, 478
Computing infrastructure: 482, 483, 484, 489
Intelligent systems: 442, 445, 467, 486, 492
Software development: 381, 481, 482, 484, 493, 494
Theory of computation: 475, 477
Web technology & applications: 285, 388, 48
(Fall 2012–Summer 2017) Computer Science–Eng

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: www.rackham.umich.edu/student_life/health_and_wellness/resources/mental_health/

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, IOE, Civil, etc.) can count toward Flexible Technical Electives. EECS 499 is only open to seniors; sophomores & juniors should consider EECS 399 (counts as Flexible Technical Elective credit, up to 4 credits).

Course Sequencing and Workload: How many EECS classes should I take simultaneously? We periodically ask students about the workload associated with CS classes, and the survey results are available at http://www.eecs.umich.edu/eecs/undergraduate/survey/. Survey results are summarized below. However, note there is considerable variance for courses because different students are challenged by different aspects of courses (writing complicated programs, understanding mathematical concepts, etc.).

Extremely heavy (average workload > 3 on 4 point scale): 373, 381, 467, 470, 482, 494
Heavy (2.5-3 on 4 point scale): 281, 442, 445, 477, 483
Moderate (1.75-2.5 on 4 point scale): 203, 280, 370, 376, 388, 441, 475, 478, 481, 484, 485, 487, 489, 492, 493, 497
Light (1-1.75 on 4 point scale): 183, 285, 496

CS courses can be highly demanding relative to many courses at the University, so students should avoid overloading themselves. For most, 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 of moderate load or less), and what non-CS courses are being taken concurrently. Students should talk with faculty advisors 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 TechComm Dept. handles TCHNCLCM courses. Please visit http://techcom.engin.umich.edu/ for more information.

Majoring in Computer Science at UM provides many exciting 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. http://www.eecs.umich.edu/eecs/undergraduate/research/undergrad-research.html

Teaching—Become an Instructional Aid: The discussion sections for 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.

Mentoring—Become a Peer Advisor: Share your experiences with other undergraduates. If you are interested, check in with the CSE 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: Enhance your undergraduate experience and resume by joining a student group: http://www.eecs.umich.edu/eecs/students/Student_Organizations.html

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 on our UG website, http://www.eecs.umich.edu/eecs/undergraduate/index.html, through the Engineering Career Resource Center (ECRC), http://career.engin.umich.edu, or through the September and January Career Fairs, http://career.engin.umich.edu/studalums/career-fairs/
### 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.*

#### Common Requirements (CoE)

<table>
<thead>
<tr>
<th>Category</th>
<th>Subject</th>
<th>Nbr</th>
<th>Sctn</th>
<th>Units</th>
<th>Term</th>
<th>Grade</th>
<th>Note</th>
</tr>
</thead>
</table>

- Units Required: 36-39
- Units In Progress and Earned: __
- Math115
- Engr100
- Chem 130 or 210
- Physics140
- Math116
- Engr101
- Chem 125/126 or 211
- Physics141
- Math214
- Physics241
- Math215/216 Math Tot: __
- Chem Earned: __
- 60 units minimum residency taken at UM-AA campus
- 30 units 300 or higher tech courses taken at UM-AA while enrolled in CoE

#### Program Subjects (Prog)

<table>
<thead>
<tr>
<th>Category</th>
<th>Subject</th>
<th>Nbr</th>
<th>Sctn</th>
<th>Units</th>
<th>Term</th>
<th>Grade</th>
<th>Note</th>
</tr>
</thead>
</table>

- Units Required: 28
- Units Earned: __
- Dept GPA: __
- EECS203
- EECS290
- EECS280
- EECS405
- STATS250/412
- TCom300
- PCDC Units Earned: __
- EECS370
- EECS496
- TCom497

#### Intellectual Breadth

<table>
<thead>
<tr>
<th>Category</th>
<th>Subject</th>
<th>Nbr</th>
<th>Sctn</th>
<th>Units</th>
<th>Term</th>
<th>Grade</th>
<th>Note</th>
</tr>
</thead>
</table>

- Units Required: 16
- Units Earned: __
- 3 Units 300-Level (UpLv)
- Units 300-499
- Unit HU
- PCDC Units Earned: __
- PCDC Units Earned: __

#### Major Design Experience (MDE)

<table>
<thead>
<tr>
<th>Category</th>
<th>Subject</th>
<th>Nbr</th>
<th>Sctn</th>
<th>Units</th>
<th>Term</th>
<th>Grade</th>
<th>Note</th>
</tr>
</thead>
</table>

- Units Required: 16
- Units Earned: __
- EECS 441, 470, 481, 494, or 497
- If 441 taken, need 11 flex tech

#### Upper Level CS Technical Electives (ULCS)

<table>
<thead>
<tr>
<th>Category</th>
<th>Subject</th>
<th>Nbr</th>
<th>Sctn</th>
<th>Units</th>
<th>Term</th>
<th>Grade</th>
<th>Note</th>
</tr>
</thead>
</table>

- Units Required: 16
- Units Earned: __
- 30 Units Toward Prog Req

#### Flexible Technical Electives (FlxTch)

<table>
<thead>
<tr>
<th>Category</th>
<th>Subject</th>
<th>Nbr</th>
<th>Sctn</th>
<th>Units</th>
<th>Term</th>
<th>Grade</th>
<th>Note</th>
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</thead>
</table>

- Units Required: 10-11
- Units Earned: __

#### General Electives (General)

<table>
<thead>
<tr>
<th>Category</th>
<th>Subject</th>
<th>Nbr</th>
<th>Sctn</th>
<th>Units</th>
<th>Term</th>
<th>Grade</th>
<th>Note</th>
</tr>
</thead>
</table>

- Units Required: 15
- Units Earned: __
- 128 Units Toward Prog Req

#### Total Earned MDE + ULCS TE + Flex Tech

<table>
<thead>
<tr>
<th>Category</th>
<th>Subject</th>
<th>Nbr</th>
<th>Sctn</th>
<th>Units</th>
<th>Term</th>
<th>Grade</th>
<th>Note</th>
</tr>
</thead>
</table>

- Units Required: 30
- Units Earned: __

#### Courses not eligible or not used for credit (NFC)

<table>
<thead>
<tr>
<th>Category</th>
<th>Subject</th>
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<th>Units</th>
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2012-2017 (Updated 7.13.16 clf)  UM-EECS: CS-Eng  Page 7 of 7