Welcome to the School of Computing

The School of Computing was originally founded as the Computer Science Department at the University of Utah in 1965 by three electrical engineering faculty members (In 2000, the department officially became the School of Computing). In 1985, the department reached 10 full-time faculty members. By 1996, it had doubled to 20. Today the School of Computing boasts 40 regular faculty members, four research faculty, and 19 adjunct faculty, with more than 420 CS undergraduate students, 90 CE undergrads, 140 enrolled in the M.S. program and 130 enrolled in the CS Ph.D. program.

The School of Computing at the University of Utah has a long history of distinguished faculty and alumni who have made substantial contributions to research and industry. SoC Ph.D. graduate John Warnock (1969) developed the Warnock recursive subdivision algorithm for hidden surface elimination, and later founded Adobe Systems, which developed the Postscript language for desktop publishing. Alan Ashton, 1970 Ph.D. graduate went on to teach at Brigham Young University and founded WordPerfect. Computer animation pioneer Ed Catmull, received both his B.S. and Ph.D. degrees in computer science from the University of Utah. Today he is the co-founder and president of Walt Disney and Pixar Animation Studios. He received a technical Academy Award in 1996 from the Academy of Motion Picture Arts and Sciences for “pioneering inventions in Digital Image Compositing.”

Today’s School of Computing faculty and students continue to carry the tradition of innovative research and technological advancements at the University of Utah.

“Almost every influential person in the modern computer-graphics community either passed through the University of Utah or came into contact with it in some way.”

- The Algorithmic Image: Graphic Visions of the Computer Age by Robert Rivlin

Our Research Areas Include:

- Computer Graphics and Visualization
- Computer Systems
- Information Management
- Natural Language Processing and Machine Learning
- Program Analysis, Algorithms and Formal Methods
- Robotics
- Scientific Computing
- Computer Architecture
# Table of Contents

<table>
<thead>
<tr>
<th>Page</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Administration</td>
</tr>
<tr>
<td>8</td>
<td>School of Computing Office Staff</td>
</tr>
<tr>
<td>9</td>
<td>School of Computing Degrees</td>
</tr>
</tbody>
</table>
| 11   | Computer Science Undergraduate Major  
     | Requirements for the CS Bachelor of Science Degree  
     | Four-Year Plan |
| 21   | Entertainment Arts and Engineering Program  
     | Requirements for the CS: EAE Bachelor of Science Degree  
     | Four-Year Plan: EAE |
| 28   | Continuing Performance Requirements |
| 30   | Advanced Placement (AP) and Math Placement |
| 32   | Computer Science Minor Requirements |
| 33   | B.S./ M.S. Program |
| 34   | Scholarships |
| 35   | Student Involvement |
| 38   | Academic Support |
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The School of Computing offers a Bachelor of Science degree in computer science. The undergraduate program begins with a set of three courses that give students a solid background in object-oriented programming while exposing them to the breadth of issues that arise in computer science.

Students then take seven core courses in discrete mathematics, software engineering, computer organization, algorithms and data structures, software systems, and theory. They build on this background by choosing seven electives from the breadth of the School’s course offerings (which includes advanced courses in theoretical computer science, scientific computing, artificial intelligence, databases, operating systems, computer networks, programming languages, graphics, computer architecture, and digital design).

Each student’s undergraduate program is capped with a senior project. Along with an in-depth study of computing, the curriculum encompasses a general education in mathematics, science, and the humanities.

The School also offers a combination B.S./M.S. degree for students who wish to complete both the Bachelor and Master of Science degrees in a total of five years. Students who want to use computers in another field may opt for a minor in computer science to supplement another degree at the University of Utah.

A Bachelor of Science in computer engineering is jointly offered by the School of Computing and the Department of Electrical and Computer Engineering. Information about that program is available in a separate handbook or from www.ce.utah.edu.

The School of Computing offers a computer science bachelor’s degree with an emphasis on Entertainment Arts and Engineering. The focus of this track is to provide interested students with the necessary skills and knowledge to enter the arena of computer gaming and animation.
BACHELOR OF SCIENCE DEGREE

The standard Bachelor of Science in computer science track is a software-oriented degree which includes 18 computer science courses, including required core, theory and elective courses. A student must be admitted as a computer science major by the School in order to take upper-division courses and pursue the computer science degree. Computer science pre-majors take five introductory math and computer science courses before applying to the major.

ENTERTAINMENT ARTS EMPHASIS

Interested students are encouraged to explore the Entertainment Arts and Engineering (EAE) emphasis through the computer science degree. This track requires courses which are relevant to computer game designers and computer animators, including drawing courses and film courses. The EAE curriculum results in a computer science degree, with an emphasis on the entertainment arts.

COMBINED B.S./ M.S. PROGRAM

The combined Bachelor of Science/Master of Science program in computer science allows students to earn a B.S. and M.S. in approximately five academic years. The B.S./ M.S. can combine a B.S. in either computer science or computer engineering with an M.S. in either computer science or computing. Undergrads will begin graduate-level courses during the senior year in order to complete the master’s degree in just one additional year.
Computer Science Pre-Major

PRE-MAJOR STATUS

Any student can become a computer science pre-major by informing the University Registrar or the School of Computing academic advisor. It is advisable to do this early to ensure receiving information about the major and staying advised of any changes that may be made in degree requirements. Declaration as a pre-major will also enable participation in activities associated with the degree program, such as the Undergraduate Student Advisory Committee, and allows students to apply for School of Computing scholarships.

Pre-majors are required to take the following courses and must achieve a C- or better (at minimum) in each course. Further, the average GPA in these courses, and the students overall UofU GPA, must be a 3.0 or higher in order to apply for full major status (FMS).

Please note that the 3.0 GPA is the minimum requirement and may not result in placement as a full major; for example when there are more applicants than available spots. In such cases, the top applicants will be selected by the SoC undergraduate admittance committee.

<table>
<thead>
<tr>
<th>PRE-MAJOR REQUIREMENTS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>All five courses are required in order to apply for full major status (FMS)</td>
<td></td>
</tr>
<tr>
<td>CS 1400 Intro to Computer Science</td>
<td>3 credits</td>
</tr>
<tr>
<td>CS 1410 Object-Oriented Programming</td>
<td>4 credits</td>
</tr>
<tr>
<td>CS 2420 Algorithms &amp; Data Structures</td>
<td>4 credits</td>
</tr>
<tr>
<td>Math 1210 Calculus I</td>
<td>4 credits</td>
</tr>
<tr>
<td>Math 1220 Calculus II</td>
<td>4 credits</td>
</tr>
</tbody>
</table>

1: Note: the math department requires a C or higher to advance to the next level of math

2: Students who are not promoted to FMS should consult with the SoC advisors about possible paths to be considered in future years. The may include retaking pre-major courses, taking CS courses that do not have a major status pre-req, or taking advanced math courses.
FULL MAJOR STATUS

In order to become a full major, a student must complete the required pre-major courses and then apply for full major status. An application may be submitted online via the CS website when the student expects to complete these requirements. Applications for admission are reviewed at the end of spring and summer semesters. New majors are only allowed into the major during fall semesters.

One may not pre-register for any upper division classes in computer science without first being admitted as a full major or a minor. Transfer students should be advised that they will only be allowed to start into full major status during the fall and should plan their transfer accordingly. Meeting with the academic advisor early to plan pre-major courses is the best way to ensure these requirements will be met in time for a fall start.

DOUBLE MAJORING

Some students may wish to earn a degree in computer science as their second bachelor’s degree. This is possible as long as the requirements for both degrees are met. In some cases, fewer additional class hours are needed for similar majors (ex: computer engineering, electrical engineering, or mathematics).

University general education and bachelor degree requirements will only need to be completed once and will be applied to both degrees. Students pursuing a double major must notify the academic advisor in both majors to become registered with the University and ensure they are meeting both sets of major requirements.

ADDING A MINOR

Students are encouraged to enhance their computer science education by adding a minor to their degree. A minor is not required, but may allow a CS student to explore other areas of interest at the University of Utah. Students may add a minor by contacting the departmental advisor for the minor for which they plan to pursue after they have been admitted to their intended major.
SCHOOL OF COMPUTING GRADUATION REQUIREMENTS

A minimum of 17 CS classes must be taken. Ten CS classes (30 credits) must be taken at the University of Utah. A student may repeat major courses (CS/math/science) only once. All major classes taken to satisfy degree requirements must be taken for a letter grade (CR/NC not accepted). A min. grade of C- or better is required for all major courses.

GENERAL EDUCATION REQUIREMENTS

Every student must complete a set of University-wide graduation requirements before receiving their bachelor's degree. The Office of Undergraduate Studies is responsible for overseeing this program. The General Education requirements are described in the University of Utah General Catalog. See University College for minimum grade requirements. The requirements for CS majors are more specific.

a. The writing requirement (WR2) is satisfied by either Wrtg 2010 or ESL 1060 (for students who speak English as a second language).

b. The quantitative reasoning (QR) requirement is satisfied by Math 1210 which is required for computer science pre-majors.

c. The two-course requirement in physical and life sciences (SF) is satisfied by classes required for the major, and no additional courses are needed.

d. Students must take two intellectual explorations courses in each: fine arts (FF), humanities (HF), and social sciences (BF). Two of these six courses must be upper division – one should meet the diversity (DV) requirement and one should meet the international (IR) requirement. Students should consult with the CS academic advisor to be sure they select appropriate classes to satisfy these requirements with a minimum number of credit hours.

e. The American institutions (AI) requirement can be satisfied by taking one of Econ 1740, Hist 1700, PolS 1100, or Honors 2212.
University Bachelor Degree Requirements

<table>
<thead>
<tr>
<th>UNIVERSITY BACHELOR DEGREE REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>The University graduation requirements for the Bachelor of Science degree are described in the University of Utah General Catalog. See University College for minimum grade requirements.</td>
</tr>
</tbody>
</table>

| a. The communication/ writing (CW) requirement: Computer science majors must take either Wrtg 3015, Wrtg 3014, Wrtg 3012, or Honors 3200 which may be taken by students participating in the University Honors Program. This class should be taken prior to taking the computer science senior project course. |

| b. The quantitative intensive (QI) course requirement is satisfied by CS 3810, CS 4150 and CS 4400, all of which are required for CS majors. |

| c. The diversity (DV) requirement can be satisfied by taking a course from an approved list as part of the intellectual explorations courses. |

| d. The international (IR) requirement can be satisfied by taking a course from an approved list as part of the intellectual explorations courses. |

| e. Students must complete a minimum of 122 total semester hours of course work. At least 40 of the 122 hours must be upper-division classes. Upper-division classes are numbered 3000 or above. Credits from two-year colleges will not count toward University upper division hours. At least 30 of the total credit hours and 20 of the last 30 hours must be taken at the University of Utah. |

It is possible to take some classes that can satisfy several general education requirements at once, such as incorporating the diversity, upper-division, and international requirements into your six required general education courses. Please ask the computer science academic advisor about such options.
Math, Science and Engineering Requirements

MATH, SCIENCE AND ENGINEERING REQUIREMENTS
Seven classes in math, science, and/or engineering are required. The School of Computing requires a grade of C- or better in each of these courses (CR/NC not accepted). Please note that the math department requires a solid “C” grade in prerequisite math courses in order to take the next math course.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math 1210</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>Math 1220</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>Math 2210</td>
<td>Calculus III</td>
<td>3</td>
</tr>
<tr>
<td>Physics 2210</td>
<td>Physics for Scientists and Engineers I</td>
<td>4</td>
</tr>
</tbody>
</table>

One math elective must be selected from the following. C- or better required.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math 2270</td>
<td>Linear Algebra</td>
<td>4</td>
</tr>
<tr>
<td>CS 3130</td>
<td>Engineering Probability and Statistics</td>
<td>3</td>
</tr>
</tbody>
</table>

Two additional math/ science courses, each of which must be at least three semester hours, may be chosen from among the following. C- or better required.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics 2220</td>
<td>Physics for Scientists and Engineers II</td>
<td>4</td>
</tr>
</tbody>
</table>

1 Math 2250 covers the same material as Math 2270 and 2280, although in less depth. Hence, if 2270 is used as a required elective, Math 2250 may not be counted as an elective.

2 If CS 3130 or ECE 3530 is used as one of the required math/science electives, Math 5010 and/or Math 3070 may not be counted as math elective.

3 Math 2200 will not be accepted. Biol 1210: Principles of Biology or Chem 1210: General Chemistry I may also be accepted as a math/ science elective (labs not required).
# Computer Science Major Requirements

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 1400</td>
<td>Intro to Computer Science</td>
<td>3</td>
</tr>
<tr>
<td>CS 1410</td>
<td>Intro to Object-Oriented Programming</td>
<td>4</td>
</tr>
<tr>
<td>CS 2420</td>
<td>Intro to Algorithms &amp; Data Structures</td>
<td>4</td>
</tr>
<tr>
<td>CS 2100</td>
<td>Discrete Structures</td>
<td>3</td>
</tr>
<tr>
<td>CS 3500</td>
<td>Software Practice I</td>
<td>4</td>
</tr>
<tr>
<td>CS 3505</td>
<td>Software Practice II</td>
<td>3</td>
</tr>
<tr>
<td>CS 3810</td>
<td>Computer Organization</td>
<td>4</td>
</tr>
<tr>
<td>CS 4150</td>
<td>Algorithms</td>
<td>4</td>
</tr>
<tr>
<td>CS 4400</td>
<td>Computer Systems</td>
<td>4</td>
</tr>
</tbody>
</table>

**Theory restricted elective. C- or better required. One of the following must be completed:**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 3100</td>
<td>Models of Computation</td>
<td>3</td>
</tr>
<tr>
<td>CS 3200</td>
<td>Scientific Computing</td>
<td>3</td>
</tr>
</tbody>
</table>

**Seven CS elective classes: See next page for guidelines and restrictions**

**Capstone requirement. C- or better required. Choose one set:**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 4000</td>
<td>Senior Capstone Design</td>
<td>3</td>
</tr>
<tr>
<td>CS 4500</td>
<td>Senior Capstone</td>
<td>3</td>
</tr>
</tbody>
</table>

Students enrolling in the Senior Capstone course (CS 4500) must graduate before the next offering of the course. The capstone course is about demonstrating the skills and abilities learned in other CS courses. It is highly recommended that a majority of your CS electives be completed before taking the capstone.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 4940</td>
<td>Undergraduate Research</td>
<td>3</td>
</tr>
<tr>
<td>CS 4970</td>
<td>Bachelor’s Thesis</td>
<td>3</td>
</tr>
</tbody>
</table>

Approval from the Undergraduate Director and an advising faculty member is required. Students should begin research for the thesis course at least one semester before enrolling in CS 4970.

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1. EAE 4500 & EAE 4510 may be accepted as an alternate senior capstone project.
2. Special permission is required by the EAE director for non-EAE track students to enroll.
Computer Science Elective Requirements

CS Elective Requirements. C- or better required.

Seven (7) total CS electives (3-4 credits each), 3000-level or higher are required for the regular CS track. All courses must be taken for a letter grade. Grad-level CS courses may be accepted with permission of the professor, but may not count for both an undergrad and graduate degree. Seminars, CS 3130 not accepted. Note that only (1) mobile development course (such as, but not limited to: iPhone, Android development) will be accepted as an elective.

See track elective suggestions (following page) for suggestions. Students should be aware of required pre-requisites and plan early for registration of desired electives. See additional requirements/restrictions below.

1. CS _____________________ / ________________ / ________________(3-4 cr)
2. CS _____________________ / ________________ / ________________(3-4 cr)
3. CS _____________________ / ________________ / ________________(3-4 cr)
4. CS _____________________ / ________________ / ________________(3-4 cr)

For the final three electives, students may choose any regular CS elective as allowed above, OR no more than (3) of the following options. C- or better required.

• (1) CS 4010, Internship (with approval)
• (1) CS 4940, Undergraduate Research (if not used for the capstone)
• (1) CS 4950), Independent Study (with approval)
• Up to (2) EAE courses (such as, but not limited to: EAE 3600, 3605, 3640, 3660, and EAE special topics)
• Up to three credits of 1-2 credit CS electives, such as, but not limited to, CS 3011, CS 3020, CS 3992, CS 4010, CS 4190, CS 5040 and special topics.

Four-credit classes from the above category cannot be combined with one or two-credit courses to equal an elective.

5. CS _____________________ / ________________ / ________________ (3-4 cr)
6. CS _____________________ / ________________ / ________________ (3-4 cr)
7. CS _____________________ / ________________ / ________________ (3-4 cr)
### Undergraduate Track Elective Suggestions

<table>
<thead>
<tr>
<th>Software Development</th>
<th>Computer Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>4230: Parallel Programming</td>
<td>4230: Parallel Programming</td>
</tr>
<tr>
<td>4480: Computer Networks</td>
<td>4480: Computer Networks</td>
</tr>
<tr>
<td>4540: Web Software Architecture</td>
<td>4540: Web Software Architecture</td>
</tr>
<tr>
<td>5140: Data Mining</td>
<td>5140: Data Mining</td>
</tr>
<tr>
<td>5460: Operating Systems</td>
<td>5460: Operating Systems</td>
</tr>
<tr>
<td>5470: Compilers</td>
<td>5470: Compilers</td>
</tr>
<tr>
<td>5530: Database Systems</td>
<td>5530: Database Systems</td>
</tr>
<tr>
<td>5xxx: Scripting Language/Design</td>
<td>5xxx: Scripting Language/Design</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Web/Mobile Development</th>
<th>Programming Languages</th>
</tr>
</thead>
<tbody>
<tr>
<td>4540: Web Software Architecture</td>
<td>5100: Foundations of CS</td>
</tr>
<tr>
<td>4480: Computer Networks</td>
<td>5470: Compilers</td>
</tr>
<tr>
<td>5530: Database Systems</td>
<td>5510: Programming Languages</td>
</tr>
<tr>
<td>5540: Human Computer Interaction</td>
<td>5xxx: Scripting Language/Design</td>
</tr>
<tr>
<td>4xxx: iPhone/Android Development</td>
<td></td>
</tr>
<tr>
<td>5xxx: Scripting Language/Design</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Computer Organization</th>
<th>Robotics</th>
</tr>
</thead>
<tbody>
<tr>
<td>3700: Digital System Design</td>
<td>5300: Artificial Intelligence</td>
</tr>
<tr>
<td>3710: Computer Design Lab</td>
<td>5310: Robotics</td>
</tr>
<tr>
<td>5460: Operating Systems</td>
<td>5320: Computer Vision</td>
</tr>
<tr>
<td>5710: Digital VLSI Design</td>
<td>5350: Machine Learning</td>
</tr>
<tr>
<td>5830: VLSI Architecture</td>
<td>5780: Embedded System Design</td>
</tr>
<tr>
<td></td>
<td>5xxx: Robot Control</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Embedded Systems</th>
<th>Artificial Intelligence</th>
</tr>
</thead>
<tbody>
<tr>
<td>3710: Computer Design Lab</td>
<td>4640: Image Processing Basics</td>
</tr>
<tr>
<td>4480: Computer Networks</td>
<td>5130: Computational Statistics</td>
</tr>
<tr>
<td>5470: Compilers</td>
<td>5140: Data Mining</td>
</tr>
<tr>
<td>5780: Embedded System Design</td>
<td>5300: Artificial Intelligence</td>
</tr>
<tr>
<td>5785: Adv. Embedded Software</td>
<td>5320: Computer Vision</td>
</tr>
<tr>
<td>5789: Embedded Sy/Kinetic Art</td>
<td>5340: Natural Language</td>
</tr>
<tr>
<td></td>
<td>5350: Machine Learning</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CAD for Digital Systems</th>
<th>Visual Computing</th>
</tr>
</thead>
<tbody>
<tr>
<td>5710: Digital VLSI Design</td>
<td>3200: Intro Sci Comp</td>
</tr>
<tr>
<td>5750: Synthesis/Veri. VLSI Sys.</td>
<td>5320: Computer Vision</td>
</tr>
<tr>
<td>5830: VLSI Architecture</td>
<td>5350: Machine Learning</td>
</tr>
<tr>
<td></td>
<td>5610: Interactive Comp Graph</td>
</tr>
<tr>
<td></td>
<td>5630: Scientific Visualization</td>
</tr>
<tr>
<td></td>
<td>5650: Perception for Graphics</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Graphics/ EAE</th>
<th>EAE Courses (2 allowed as electives)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3200: Intro Sci Comp</td>
<td>3600: 3D Modeling</td>
</tr>
<tr>
<td>4640: Image Processing Basics</td>
<td>3640: Digital Figure Sculpting</td>
</tr>
<tr>
<td>5320: Computer Vision</td>
<td>3660: Machinima</td>
</tr>
<tr>
<td>5350: Machine Learning</td>
<td></td>
</tr>
<tr>
<td>5530: Database Systems</td>
<td>5xxx: Character Rigging</td>
</tr>
</tbody>
</table>
CS Degree Requirements

COMPUTER SCIENCE 2013-2014  B.S. Degree Requirements

For advising, contact webad-help@cs.unm.edu or call 801-581-8224 to schedule an appointment

PRE-MAJOR REQUIREMENTS:

C- or better in each course, and a minimum 3.0 average GPA (overall and within pre-major courses) required to apply for full major status.

1. CS 1400, Intro. to CS (3-3/0)
2. CS 1410, Object-Oriented Prog. (3-2/0)
3. CS 2420, Algorithms/Data Struct (4-2/0)
4. Math 1210, Calculus I (QR) (5)
5. Math 1220, Calculus II (QR) (4)

GENERAL EDU. REQUIREMENTS:

- Honor's option only recognized for WRTG, CFW, and IFM requirements.
- WRTG 3010, Intermediate Writing (WRTG) (5)
- WRTG 3012 or 3014 or 3015 (CFW) (5)
- Spanish 2011, Structures (3-3/0)

SIX Intellectual Exploration (IE) courses required. TWO must be upper division (3000-level or above). CHNS must satisfy the Diversity requirement and CHNS must satisfy the International requirement.

1. Fine Arts (FF): (5)
2. Fine Arts (FF): (5)
3. Humanities: (5)
4. Humanities: (5)
5. Social/Behavioral Science (UR): (5)
6. Social/Behavioral Science (UR): (5)
   - Upper Division (3000+ level E)
   - Upper Division (3000+ level E)
   - Diversity (UR)
   - International (UR)

MATH / SCIENCE ELECTIVES:

C- or better required in all math/science courses. 2-4 additional electives must be 5-credit each, and satisfy as follows:

(Not Accepted: A course is not acceptable CS 2160, Math 2200, Math 2260, Art 2200, or Math 2280 are taken. Math 3090 and Math 3090 are taken if CS 3120 and Math 3350 are both taken.)

1. Physics 2210, Physics I (5)
2. Math 2210, Calculus II (QR) (5)
3. Math 2270 Linear Algebra (QR) (5)
4. CS 3130 Eng. Ethics & Stats (QR) (5)
5. ___________________________ (5)

The following requirements are restricted to FULL MAJORS:

C- or better required in all CS courses. CS/CHNS grading system not allowed for any major requirement. 2.5 GPA (overall & CS courses) required to graduate.

MAJOR REQUIREMENTS:

1. CS 2100, Discrete Structures (3-3/0)
2. CS 3500, Software Practice I (3-3/0)
3. CS 3505, Software Practice II (3-3/0)
4. CS 3810, Computer Organization (QR) (4-3)
5. CS 4150, Algorithms (QR) (3-3/0)
6. CS 4400, Computer Systems (QR) (4-3)

CS ELECTIVES:

Choose 7 total CS courses, 3000-level or above. 3-4 credits each. Seminars and CS 5130 not accepted. Only 1 Mobile Apps course will be accepted.

1. CS / / / ( )
2. CS / / / ( )
3. CS / / / ( )
4. CS / / / ( )
5. CS / / / ( )
6. CS / / / ( )
7. CS / / / ( )

No more than 3 of the following may be accepted above as CS electives:

- (2) CS 4980, Internship
- (2) CS 4990, Internship (if not used for capstone)
- (2) CS 4990, Independent Study
- (2) Mobile Apps courses: BUS 5400, 5405, 5440, 5445
- (2) combination of 1-3 credit CS courses (5 credits total): CS 5011, 5250, 4130, 4049 and 1-2 credit special topic courses

THEORY RESTRICTED ELECTIVE:

Choose ONE (if both choices are taken, one will count as a CS elective above)

CS 3100, Models of Computation (QR) (3-3/0)

or

CS 3320, Scientific Computing (3-3/0)

CAPSTONE REQUIREMENT:

Choose ONE set: (Permission required from Undergraduate Director for thesis)

CS 4990, Senior Capstone Design (3-3/0)

CS 4950, Senior Capstone Project (3-3/0)

or

CS 4940, Undergraduate Research (3)

CS 4970, Bachelor's Thesis (3)

See the CS Undergraduate Handbook online for complete details, restrictions & requirements

Updated 08/13
The CS degree can be completed in four full-time years if the student can take the pre-major courses during freshman year. If a student must take preparatory classes as a freshman, more than four years may be required. It is possible to take general education and/or math requirements during the summer. This table is meant only as a guide, since the scheduling of electives may vary. See the departmental advisor for suggested changes to this sequence.

*CS 1410 may be taken during the freshman fall semester by passing a proficiency test to waive CS 1400. If 1400 is needed, students may take CS 1400 fall semester, 1410 in the spring and 2420 in the summer semester to stay on track.

<table>
<thead>
<tr>
<th></th>
<th>Fall Semester</th>
<th>Spring Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshman</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(27 credits)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS 1400 (or CS 1410*)</td>
<td>3</td>
<td>CS 1410 (or CS 2420*)</td>
</tr>
<tr>
<td>Math 1210 Calc I</td>
<td>4</td>
<td>Math 1220 Calc II</td>
</tr>
<tr>
<td>Wrtg 2010 Writing</td>
<td>3</td>
<td>American Institutions (AI)</td>
</tr>
<tr>
<td>General Ed</td>
<td>3</td>
<td>General Ed</td>
</tr>
<tr>
<td>**</td>
<td>(13)</td>
<td>(14)</td>
</tr>
<tr>
<td>Summer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>* if needed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(7 credits)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS 2420</td>
<td></td>
<td>CS 2100 Discrete</td>
</tr>
<tr>
<td>Math 2210</td>
<td>4</td>
<td>CS 3505 Software Prac. II</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CS elective</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Phys 2210 Physics I</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(13)</td>
</tr>
<tr>
<td>Sophomore</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(28 credits)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS 3500 Software Prac. I</td>
<td>4</td>
<td>CS 3200 Theory elective</td>
</tr>
<tr>
<td>CS 3810 Comp. Org.</td>
<td>4</td>
<td>CS 4150 Algorithms</td>
</tr>
<tr>
<td>Math 2270 or CS 3130</td>
<td>4 or 3</td>
<td>CS elective</td>
</tr>
<tr>
<td>General Ed/ DV</td>
<td>3</td>
<td>Wrtg 3012, 3014 or 3015</td>
</tr>
<tr>
<td></td>
<td>(15)</td>
<td>Gen Ed/ IR/ Upper Division</td>
</tr>
<tr>
<td>Junior</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(29 credits)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS 4400 Comp. Systems</td>
<td>4</td>
<td>CS 4500 or CS 4970</td>
</tr>
<tr>
<td>CS elective</td>
<td>3</td>
<td>CS elective</td>
</tr>
<tr>
<td>CS elective</td>
<td>3</td>
<td>Math/ Science elective</td>
</tr>
<tr>
<td>Math/ Science elective</td>
<td>4</td>
<td>General Ed</td>
</tr>
<tr>
<td></td>
<td>(14)</td>
<td>(Free elective if needed**)</td>
</tr>
<tr>
<td>Senior</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(31 credits)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS 4000 or CS 4940</td>
<td>3</td>
<td>CS 4500 or CS 4970</td>
</tr>
<tr>
<td>CS elective</td>
<td>3</td>
<td>CS elective</td>
</tr>
<tr>
<td>CS elective</td>
<td>3</td>
<td>Math/ Science elective</td>
</tr>
<tr>
<td>General Ed/ Upper Division</td>
<td>3</td>
<td>General Ed</td>
</tr>
<tr>
<td>(Free elective if needed**)</td>
<td>3</td>
<td>(Free elective if needed**)</td>
</tr>
<tr>
<td>**</td>
<td>(15)</td>
<td>(16)</td>
</tr>
</tbody>
</table>

1. Choose between CS 3100 or 3200 for the theory requirement. CS 3100 is offered in the fall.
2. The thesis option requires special permission from the faculty and Undergraduate Director. This option is intended for students who are considering graduate school.

General Eds include FF, HF, BF requirements. See advisor for doubling these with the DV and IR requirements.

** Free electives only needed if student has not yet reached the 122 total credit hours required to graduate.
Entertainment Arts and Engineering Program

ENTERTAINMENT ARTS AND ENGINEERING EMPHASIS

The School of Computing provides a specialty track through the computer science program with an emphasis on Entertainment Arts and Engineering (EAE). The EAE emphasis is a joint program between the School of Computing and the College of Fine Arts Division of Film Studies.

The purpose of this program is to provide an undergraduate, interdisciplinary academic path for those students that wish to have careers in the digital entertainment industry (video games, digital animation, computer generated special effects, etc.). There are currently two specified tracks: video games and animation, differing by the junior year game/anIMATION series of classes.

The key feature of this program is its interdisciplinary nature. Students from both computer science and fine arts take common classes throughout their undergraduate years, culminating in a year-long senior studio project where students build a video game or animation from the ground up. Students in the program choose either a bachelor’s degree in film studies or computer science. The requirements listed below are for the computer science Bachelor of Science degree, with an emphasis in EAE.

All requirements of the general computer science degree must be met. The specifics of the track are listed below where they extend the requirements of the traditional computer science bachelor’s degree:

### EAE GENERAL EDUCATION REQUIREMENTS

Same as the regular CS track (page 13), with the following exception:
- Fine arts (FF) requirement — Art 1020 (Non-major Basic Drawing) replaces one fine arts elective.

### EAE UNIVERSITY BACHELOR DEGREE REQUIREMENTS

Same as the regular CS track (page 14) with the following exception:
- CW requirement — FA 3600 (Writing for New Media) replaces the upper division writing requirement.
## EAE MATH, SCIENCE AND ENGINEERING REQUIREMENTS

Six classes in math, science, and/or engineering are required. The School of Computing requires a grade of C- or better in each of these courses (CR/NC not accepted). Please note that the math department requires a solid “C” grade in prerequisite math courses in order to take the next math course.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math 1210</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>Math 1220</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>Math 2210</td>
<td>Calculus III</td>
<td>3</td>
</tr>
<tr>
<td>Physics 2210</td>
<td>Physics for Scientists and Engineers I</td>
<td>4</td>
</tr>
<tr>
<td>CS 3130</td>
<td>Engineering Probability and Statistics</td>
<td>3</td>
</tr>
</tbody>
</table>

One additional course, at least three hours, may be chosen from the following. C- or better required.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math 2270</td>
<td>Linear Algebra</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td><strong>Any non-CS class from the Colleges of Engineering, Mines, or Science that requires Calculus II as a prerequisite or corequisite</strong></td>
<td></td>
</tr>
<tr>
<td>Biol 1210</td>
<td>Principles of Biology</td>
<td>4</td>
</tr>
<tr>
<td>Chem 1210</td>
<td>General Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>Physics 2220</td>
<td>Physics for Scientists and Engineers II</td>
<td>4</td>
</tr>
</tbody>
</table>

1 CS 3130 or ECE 3530 covers material similar to Math 5010 and/or Math 3070, and as such Math 5010 and/or Math 3070 may not be counted as an elective. Math 2200 will not be accepted.

Biol 1210, Chem 1210, Phys 2210 and Phys 2220 additional labs not required.
COMPUTER SCIENCE EAE MAJOR REQUIREMENTS

A minimum of 17 computer science classes must be taken. Ten CS classes (30 credits) must be taken at the U of U. A student may repeat CS, math and EAE major courses only once. All major classes taken to satisfy degree requirements must be taken for a letter grade; they may not be taken for CR/NC. A min. grade of C- or better is required for all major courses.

EAE 1400 Intro to Computer Science 3 credits
EAE 1410 Intro to Object-Oriented Programming 4 credits
EAE 2420 Intro to Algorithms & Data Structures 4 credits

CS Core Requirements. C- or better required.

CS 2100 Discrete Structures 3 credits
CS 3500 Software Practice I 4 credits
CS 3505 Software Practice II 3 credits
CS 3810 Computer Organization 4 credits
CS 4150 Algorithms 3 credits
CS 4400 Computer Systems 4 credits

Required Courses. C- or better required.

EAE 3600 3D Modeling 3 credits
EAE 3660 Machinima 3 credits
CS 5300 Artificial Intelligence 3 credits

CHOOSE ONE:
CS 5460 Operating Systems 4 credits
CS 5470 Compilers 4 credits
CS 5530 Databases 3 credits

Theory Restricted Elective. C- or better required. Choose one of the following:

CHOOSE ONE:
CS 3200 Scientific Computing 3 credits
CS 3100 Models of Computation 3 credits
Entertainment Arts and Engineering Program

| Film requirements. C- or better required. The following classes are required: |
|-----------------|-------------------------------------------------|---------------|
| FILM 2700       | Survey of Videogame Theory                      | 3 credits     |
| FILM 3500       | Film Production I                               | 4 credits     |

| Series requirement. C- or better required. One of the following series must be taken: |
|----------------------------------------------------------------------|---------------------------------|---------------|
| COMPUTER ANIMATION SERIES:                                           |                                 |               |
| FILM 2610             | Computer Animation I               | 4 credits     |
| FILM 2620             | Computer Animation II              | 4 credits     |
| GAME DEVELOPMENT SERIES:                                           |                                 |               |
| FILM 3710             | Traditional Game Development       | 4 credits     |
| FILM 3720             | Alternative Game Development       | 4 credits     |

| Computer science elective. C- or better required. Any CS elective 4000 level or above, at least 3 credits, will be accepted. One of the following classes is recommended: |
|-----------------------------------------------------------------|---------------------------------|---------------|
| CS 4540             | Web Software Architecture      | 3 credits     |
| CS 4480             | Computer Networks              | 3 credits     |
| CS 4600             | Intro to Graphics              | 3 credits     |
| CS 5350             | Machine Learning               | 3 credits     |
| CS 5630             | Scientific Visualization       | 3 credits     |

| Capstone requirement. C- or better required. Both courses are required: |
|-----------------|-------------------------------------------------|---------------|
| EAE 4500        | Senior Project I                               | 3 credits     |
| EAE 4510        | Senior Project II                              | 3 credits     |

1 Must be 3-4 credits. Excludes ANY OTHER EAE COURSES, CS seminars, and CS 3130.
EAE Degree Requirements

COMPUTER SCIENCE 2013-2014 B.S. Degree Requirements
Entertainment Arts & Engineering (EAE) emphasis
For advising, contact mornet-dehr@usc.edu or call 203-581-4224 to schedule an appointment

PRE-MAJOR REQUIREMENTS:
GPA of 2.0 or better in each course, and a minimum 5.0 average GPA (overall and within pre-major courses) required to apply for full major status.
1. BABS/CS 1400, Intro to CS
2. BABS/CS 1410, Object-Orient. Prog.
3. BABS/CS 2420, Algorithms/Data Strct.
4. Math 1210, Calculus I (QQ)
5. Math 1220, Calculus II (QQ)

GENERAL EDU. REQUIREMENTS:
For institutional education (EE) courses required, 19-19 must be upper division (3000-level or above). CME must satisfy the Diversity requirement and CME must satisfy the International requirement.
1. WRIT 2010, Intermediate Writing (WR)
2. FA 3600, Writing for New Media (GQ)
3. American Institutions (AI)

MAJOR REQUIREMENTS:
GPA of 2.0 or better required in all CS courses. CGRE grading system not offered for any major requirement. 2.5 GPA (overall & CS courses) required to graduate.
1. CS 2100, Discrete Structures
2. CS 2500, Software Practice I
3. CS 2505, Software Practice II
4. CS 3810, Computer Organization (GQ)
5. CS 4150, Algorithms (GQ)
6. CS 4400, Computer Systems (GQ)

EAE REQUIREMENTS:
1. BAE 3500, 3D Modeling
2. BAE 3650, Mechanics
3. CS 3500, Artificial Intelligence
4. CS 3530, Database
5. Choose One of the following, or one course as the CS elective below
   CS 5460, Operating Systems
   or
   CS 5470, Computers

CS ELECTIVE:
Choose One: 4000+ level CS course (3-4 cr). Seminars and EAE courses not accepted. 
   Requirement: CS 4100, 4210, 4200, 4310, 4320
1. 

SERIES REQUIREMENTS:
Choose One:
ANIMATION SERIES
   FILM 3610, Computer Animation I
   FILM 3620, Computer Animation II
   or
GAME DESIGN SERIES
   FILM 3710, Traditional Game Development
   FILM 3720, Alternate Game Development

THEORY RESTRICTED ELECTIVE
Choose One
   CS 3110, Models of Computation (QQ)
   or
   CS 3200, Scientific Computing

CAPSTONE REQUIREMENT
1. BAE 4500, Senior Project I
2. BAE 4510, Senior Project II
See the CS Undergraduate Handbook online for complete details

Updated 08/13
The CS degree can be completed in four full-time years of study if the student can take the pre-major courses during freshman year. If a student must instead take preparatory classes as a freshman, more than four years may be required. It is possible to take general education and/or math requirements during the summer to ease the load. This table is meant only as a guide, since the scheduling of electives and general education classes may vary.

*EAE 1410 may be taken during the freshman fall semester by passing a proficiency test to waive EAE 1400. If 1400 is needed, students may take EAE 1400 fall semester, 1410 in the spring and 2420 in the summer semester to stay on track.

<table>
<thead>
<tr>
<th>Freshman (27 credits)</th>
<th>Fall Semester</th>
<th>Spring Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>EAE 1400 (or EAE 1410*)</td>
<td>3</td>
<td>EAE 1410 (or EAE 2420*)</td>
</tr>
<tr>
<td>Math 1210 Calculus I</td>
<td>4</td>
<td>Math 1220 Calculus II</td>
</tr>
<tr>
<td>Wrtg 2010 Writing</td>
<td>3</td>
<td>American Institutions (AI)</td>
</tr>
<tr>
<td>Art 1020 Basic Drawing</td>
<td>3</td>
<td>Film 2700 Video Games</td>
</tr>
<tr>
<td>(13)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sophomore (28 credits)</th>
<th>Fall Semester</th>
<th>Spring Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 3500 Software Prac. I</td>
<td>4</td>
<td>CS 2100 Discrete</td>
</tr>
<tr>
<td>CS 3810 Comp. Org.</td>
<td>4</td>
<td>CS 3505 Software Prac. II</td>
</tr>
<tr>
<td>EAE 3600 3D Modeling</td>
<td>3</td>
<td>EAE 3660 Machinima</td>
</tr>
<tr>
<td>Film 3500 Film Production</td>
<td>4</td>
<td>Phys 2210 Physics I</td>
</tr>
<tr>
<td>(15)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Junior (32 credits)</th>
<th>Fall Semester</th>
<th>Spring Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 4400 Comp. Systems</td>
<td>4</td>
<td>CS 3200 Scientific Comp.</td>
</tr>
<tr>
<td>FA 3600 Wrtg New Media</td>
<td>3</td>
<td>CS 4150 Algorithms</td>
</tr>
<tr>
<td>Math/ Science elective</td>
<td>4</td>
<td>CS 5460 Operating Syst.</td>
</tr>
<tr>
<td>Film 3610 or 3710</td>
<td>4</td>
<td>Film 3620 or 3720</td>
</tr>
<tr>
<td>Film 3610 or 3710</td>
<td>4</td>
<td>General Ed/ DV</td>
</tr>
<tr>
<td>(15)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Senior (30 credits)</th>
<th>Fall Semester</th>
<th>Spring Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>EAE 4500 Senior Project I</td>
<td>3</td>
<td>EAE 4510 Senior Project II</td>
</tr>
<tr>
<td>CS 3130 Eng. Prob. &amp; Stats</td>
<td>3</td>
<td>CS 5300 A.I.</td>
</tr>
<tr>
<td>CS elective</td>
<td>3</td>
<td>CS 5530 Databases</td>
</tr>
<tr>
<td>General Ed</td>
<td>3</td>
<td>General Ed/ Upper Division</td>
</tr>
<tr>
<td>Gen Ed/ IR/ Upper Division</td>
<td>3</td>
<td>General Ed</td>
</tr>
<tr>
<td>(15)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. CS 3200 is the recommended theory course, but CS 3100 (fall semester) will also be accepted.
2. CS 5460 is recommended, but CS 5470 will also be accepted. CS 5470 is offered in the spring.

General Eds include FF, HF, BF requirements. See advisor for doubling these with the DV and IR requirements.
PERFORMANCE REQUIREMENTS

All major courses (computer science, science, engineering, film, and writing) taken to satisfy the major requirements must be taken for a letter grade and must be passed with a C- or better. Mathematics courses require a C or higher to move on to the next level of math.

REPEAT POLICY

A student may repeat required courses for the major and pre-major once only. This includes all CS, math, science and film courses. Withdrawals (W) and grades (A,B,C,D,E,CR/NC) are all counted as an attempt. After two unsuccessful attempts, a student will be removed from the major and must petition to the undergraduate committee for re-admittance. Pre-majors will only be allowed two attempts at pre-major courses. A third attempt will not count toward admittance into the major, but may be considered by petition.

CS major and math/science required courses that have been attempted at the U may not be repeated and transferred from another school for credit in the computer science major.

PROBATION

To remain in good standing and graduate, a student must maintain a cumulative grade point average at the University of 2.5 or higher, and also maintain a grade point average (GPA) of 2.5 in computer science classes. Students whose GPA in either of these categories falls below 2.5 will be placed on probation and given conditions to return to good standing. These conditions must be satisfied during the next two semesters, excluding summers. Students failing to meet their probationary conditions are removed from the major.

ACADEMIC MISCONDUCT

Computer science majors are required to adhere to an Academic Misconduct Policy. Students will be required to review and sign the Policy when applying to the major, and the policy applies to all computer science pre-major and major courses. Failure to adhere to Misconduct standards could result in removal from the major. See the full policy on the CS website www.cs.utah.edu.
PROGRAM COMPLETION

Students are expected to complete all requirements for their degree within four years of being admitted as a full major. Students not making satisfactory progress toward their degrees may be dropped from the rolls and declared inactive. The determination that a student is not making satisfactory progress is made in one of two ways.

(1) The student has not completed a computer science course for a period of one year (exceptions made for students who take an official Leave of Absence with the University), or

(2) There is no reasonable way in which the student can complete all degree requirements by the end of the required period of time. In order to be reinstated from inactive status or from being dropped due to low GPA, students must petition the Computer Science Undergraduate Committee. Reinstated students proceed under the latest graduation requirements.

If personal circumstances prevent completion of all degree requirements within four years of acceptance as a full major, a student may request an extension and submit a revised schedule of completion.

EXPIRATION OF CREDITS

All major courses (CS, math, science) will expire after ten years, and it may be necessary for students to retake major courses that are more than ten years old. Students are advised to meet with the undergraduate director to discuss math and CS courses that were taken more than five years prior.

GRADUATION EXIT SURVEY

In order to better serve our students and evaluate our program, computer science graduating seniors are required to complete a Graduation Exit Survey before they are cleared for graduation. All identifying information (name, student ID number) will be removed from student responses to maintain anonymity.
AP and Math Placement

ADVANCED PLACEMENT (AP) EXAM CREDIT

Credit for Advanced Placement tests is given through the University and counts toward the total hours needed to graduate. The Admissions Office assesses all general education AP credits. Specific courses in the Computer Science major (computer science, math, physics, chemistry, and biology) are waived based on high AP exam scores, independent of these credit hours. Students should submit a AP Evaluation Form to the Admissions Office to have their AP credits officially recorded toward University graduation requirements.

The scores on the following page are necessary for the School of Computing to waive a major requirement. While lower scores may result in University of Utah credit, they will not satisfy School of Computing requirements. The School of Computing will not accept AP scores of 3 in some areas. For a detailed list of AP scores that may satisfy general education courses, please visit admissions.utah.edu.

MATH PLACEMENT

Math placement depends on an Accuplacer test score, math scores in AP, ACT or SAT exams, or previous transfer work. Accuplacer, AP, ACT and SAT scores are valid for two years after the test is taken. To challenge a placement score students may take a math placement exam at the Testing Center (801-581-8733, 498 SSB).

<table>
<thead>
<tr>
<th>Pre-Requisite Requirements</th>
<th>Math Course Placement</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACT Math score of 17 or lower</td>
<td>Math 990 - Elementary Algebra</td>
</tr>
<tr>
<td>SAT Math score of 420 or lower</td>
<td></td>
</tr>
<tr>
<td>ACT Math score of 18-22</td>
<td>Math 1010 - Intermediate Algebra</td>
</tr>
<tr>
<td>SAT Math score of 430-530</td>
<td></td>
</tr>
<tr>
<td>Accuplacer EA score of 54 or better</td>
<td></td>
</tr>
<tr>
<td>ACT Math score of 23-27</td>
<td>*Math 1050 &amp; Math 1060 - College Algebra &amp; Trigonometry</td>
</tr>
<tr>
<td>SAT Math score of 540-620</td>
<td></td>
</tr>
<tr>
<td>Accuplacer CLM score of 60 or better</td>
<td></td>
</tr>
<tr>
<td>ACT Math score of 24-27</td>
<td>*Math 1080 - Pre-Calculus</td>
</tr>
<tr>
<td>SAT Math score of 560-620</td>
<td></td>
</tr>
</tbody>
</table>

* Math 1050/1060 OR Math 1080 required for Calc I, not both
Chart continued on the next page
Advanced Placement

MATH PLACEMENT CONTINUED

<table>
<thead>
<tr>
<th>Pre-Requisite Requirements</th>
<th>Math Course Placement</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP AB score of 3 or higher&lt;br&gt;ACT Math score of 28 or higher&lt;br&gt;SAT Math score of 630 or higher&lt;br&gt;Accuplacer CLM score of 95 or better</td>
<td>Math 1210 - Calculus I</td>
</tr>
<tr>
<td>AP AB score of 4 or higher&lt;br&gt;AP BC score of 3 or higher</td>
<td>Math 1220 - Calculus II</td>
</tr>
<tr>
<td>AP BC score of 4 or higher</td>
<td>Math 2210 - Calculus III</td>
</tr>
</tbody>
</table>

ADVANCED PLACEMENT EXAM COURSE EQUIVALENTS FOR COMPUTER SCIENCE

<table>
<thead>
<tr>
<th>AP Exam</th>
<th>Required Score</th>
<th>U. Course Waived</th>
<th>Course Placement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>4 or 5</td>
<td>Biol 1210</td>
<td></td>
</tr>
<tr>
<td>Chemistry</td>
<td>4 or 5</td>
<td>Chem 1210</td>
<td></td>
</tr>
<tr>
<td>Physics C: Mech</td>
<td>4 or 5</td>
<td>Phys 2210</td>
<td>Phys 2220</td>
</tr>
<tr>
<td>Physics C: E&amp;M</td>
<td>4 or 5</td>
<td>Phys 2220</td>
<td>Phys 2210</td>
</tr>
<tr>
<td>Computer Science A Test</td>
<td>5</td>
<td>CS 1400/ 1410</td>
<td>CS 2420</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>CS 1400</td>
<td>CS 1410</td>
</tr>
</tbody>
</table>
MINOR REQUIREMENTS

The minor consists of a minimum of 18 semester hours of required computer science classes (plus Calculus I). The following classes must be taken (at least three of the following CS courses must be taken at the University of Utah. CS 3500 and the CS 3000-level elective must be taken at the U):

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 1400</td>
<td>Intro to Computer Science</td>
<td>3 credits</td>
</tr>
<tr>
<td>CS 1410</td>
<td>Intro to Object-Oriented Programming</td>
<td>4 credits</td>
</tr>
<tr>
<td>CS 2420</td>
<td>Intro to Algorithms &amp; Data Structures</td>
<td>4 credits</td>
</tr>
<tr>
<td>MATH 1210</td>
<td>Calculus I</td>
<td>4 credits</td>
</tr>
<tr>
<td>CS 2100</td>
<td>Discrete Structures</td>
<td>3 credits</td>
</tr>
<tr>
<td>CS 3500</td>
<td>Software Practice I</td>
<td>4 credits</td>
</tr>
</tbody>
</table>

CS Elective: Students must take at least one additional CS class (3-4 cr) at or above the 3000 level. CS 3505 is recommended.

In order to be admitted as a computer science minor, a student must have a declared major in another department and be making progress in that major. A CS minor will not be awarded to computer engineering majors (CE), however CE majors should talk to the CS advisor about double majoring in CS and CE.

One may not pre-register for any upper division classes in computer science without first being admitted as a minor. CS minors must contact the CS advisor in order to register for 3000-level CS courses once admitted. Applications for admission are reviewed at the end of spring and summer semesters.

Students wishing to be admitted to the minor are required to take Math 1210, CS 1410, and CS 2420 and must at minimum achieve a C- or better in each course. CS 1400 may be waived for advanced students. Further, the average GPA in these courses, and the students overall UofU GPA, must be above 3.0 in order to apply for minor status.

Please note that the 3.0 GPA is the minimum requirement and may not result in placement as a minor; for example when there are more applicants then available spots. In such cases, the top applicants will be selected by the SoC undergraduate admittance committee at the same time Full Major Status is granted.
B.S./ M.S. Program

COMPUTER SCIENCE B.S./ M.S. DEGREE

The B.S./ M.S. degree program allows students to complete both a bachelor’s and master’s degree in computer science in five years. Degree requirements are the same as those for earning a B.S. and M.S. separately (122 undergraduate hours + 30 graduate hours), but there are several advantages:

- B.S./ M.S. students are not required to take the Graduation Record Examination (GRE) as part of their graduate school admittance.
- You will know early that you have been accepted into Grad School, and can plan accordingly.
- Students may take graduate classes during their senior year.
- B.S./ M.S. students may take up to 12 graduate-level credits for the undergraduate fee.

School of Computing M.S. Degree Programs:

*Master of Computer Science
*Master of Computing with a computer engineering specialization
*Master of Computing with a graphics and visualization specialization
*Master of Computing with a information technology specialization
*Master of Computing with a robotics specialization

Each of the degrees has two options: course-based and thesis-based. Students wishing to pursue the thesis option for their M.S. degree must also choose the thesis option for their B.S. degree. The bachelor’s thesis (CS 4970) will normally constitute a portion of the master’s thesis. Students are not eligible to pursue the EAE Master Game Studio degree through B.S./M.S.

Students must be a junior in the CS or CE department in order to apply. International students on a visa are not eligible for B.S./ M.S. programs. Applications for the B.S./ M.S. program are due in May and September, and must include a copy of the student’s University of Utah transcript and the B.S./ M.S. application form. For more information about the B.S./ M.S. program, graduate tracks, and how to apply, please visit: www.cs.utah.edu/bsms.
Scholarships

UNDERGRADUATE SCHOLARSHIPS

The School of Computing awards several scholarships each year. Recipients are selected based upon academic performance, rather than financial need. Most are awarded to computer science and computer engineering full majors, or to those students who will become full majors during the following academic year. Applications for these scholarships are available on the Web at www.cs.utah.edu. They must be submitted online by February 15th of the preceding year.

**Tuition Waiver Scholarships:** These awards are available to students majoring in computer science or computer engineering who are residents of the state of Utah. They cover up to 15 credit hours of resident tuition for two semesters. To be eligible, students must take at least 12 credit hours per semester and have a cumulative GPA of 3.5 or higher.

**School of Computing Scholarships:** These awards are available to all computer science and computer engineering majors. They range in value from $500 to $4,000, and are made possible by generous donations from the School of Computing faculty, alumni and companies. To be eligible, students must take at least nine credit hours per semester. Scholarships specifically for female students are available.

**College of Engineering Scholarships:** The College of Engineering awards several scholarships to the top students in the college. CS students may apply for COE scholarships simply by filling out the online application for a CS scholarship. Applications will be reviewed not only by the School of Computing, but will also be reviewed by the College of Engineering Scholarship Committee. Some College scholarships do require an additional essay during the application process. The College also has scholarships available for financial need.

Incoming transfer students and entering freshmen are not eligible to apply for the School of Computing Scholarships or Tuition Waivers until they have been admitted to the University of Utah and declared as a full or pre-major in computer science or computer engineering. These students should consider applying for U of U or College of Engineering Scholarships.

B.S./M.S. students are eligible to apply for School of Computing Scholarships, but are only eligible to receive undergraduate scholarship funding while they are finishing their undergraduate career.
Student Participation in the School of Computing

The School of Computing, the College of Engineering, and the University of Utah all offer clubs, courses, and academic support to students which can enhance their undergraduate degree. The following offers a list of many, but not all, opportunities which computer science students are encouraged to explore. For a thorough list of clubs, groups, and activities at the University of Utah, please visit ASUU at www.asuu.utah.edu.

Industry Forum

Students are encouraged to take CS 3011: Industry Forum in their junior or senior year. This course meets once weekly for one credit hour. Students will engage in presentations from local and national business leaders discussing issues in computing from industry perspectives, trends in computer science, professionalism, ethics, career readiness, lifelong learning, and contemporary issues. CS 3011 may be repeated up to three times for credit.

Research Forum

Research forum is encouraged for students who are planning to take the thesis senior project course or plan to go on to graduate school. Students attend weekly presentations from speakers discussing different research opportunities within the School of Computing, as well as problems that remain unsolved in computer science. CS 3020 is a one-credit course, and may be taken along with industry forum, programming challenges, and/or TA training to take place of one three-credit CS elective. Research forum is encouraged for sophomore or junior students.

Internships

Qualified students may count an internship experience as a CS elective course during the summer between junior and senior year. The benefits of such experience include exposure to ideas which could help with career decisions, making contacts which may be useful sometime in the future, and valuable work experience. Local internship opportunities are posted to the CS jobs board via the Undergraduate link on the CS home page. All internships must be approved by the Director of Undergraduate Studies prior to each semester.

Teaching Assistants

Paid, undergraduate teaching assistant positions are available to outstanding computer science majors. Teaching assistants enroll in CS 5040: Teaching Introductory Computer Science and work 10-20 hours/week.
Students may enroll in one independent study course (three credits) as one of the seven required CS electives. Independent study must be approved by the supporting faculty member and must be taken for a grade. Students who are interested in conducting undergraduate research may consider working with a School of Computing faculty member in an independent study course.

There are a number of ways to become involved in research as an undergraduate student. Students are encouraged to discuss research options and opportunities with College of Engineering faculty. There are two formal research avenues undergraduate students can investigate: The Merrill Engineering Scholars Fellowship and The Undergraduate Research Opportunities Program (UROP). To learn more about research in the School of Computing, visit www.cs.utah.edu/research.

The University of Utah iPhone Programmer’s Association (iPA) is an opportunity for you to meet with others who are developing for this exciting new platform. Membership is FREE, and non-students are welcome! Visit www.uofuiiphone.com for more information or to join.

The Undergraduate Student Advisory Committee (UgSAC) plays an active role in the School by coordinating the following: (1) Course and faculty teaching evaluations; (2) Representation (one student) at faculty meetings; (3) Announcements to all declared pre-majors and majors; (4) Representation on the College Student Advisory Committee; (5) Representation on the end-of-year awards committee; (6) Organization of university and high school programming contests; (7) Feedback on issues affecting students, such as scheduling, curriculum changes, and graduation requirements.

Anyone interested in joining this organization should visit csugsac.eng.utah.edu.
Student Involvement

STUDENT PARTICIPATION IN THE COLLEGE OF ENGINEERING

Women Engineers

The Society of Women Engineers (SWE), founded in 1950, is a not-for-profit educational and service organization. SWE is the driving force that establishes engineering as a highly desirable career aspiration for women. SWE empowers women to succeed and advance in those aspirations and be recognized for their life-changing contributions and achievements as engineers and leaders. For more information, visit: coe.utah.edu/swe.

Honors Programs

The College of Engineering offers an honors bachelor’s degree. For information on this program, see the college web page: www.coe.utah.edu. Students may also participate in the University’s honor program through Honors College. For more information, please visit: honors.utah.edu.

E-LEAP

Incoming engineering students should consider the Engineering LEAP (E-LEAP) program organized by the Office of Undergraduate Studies. It is a year-long cohort program set up to allow students to take several classes together during their first year on campus. Two of these classes are seminar courses that satisfy University General Education and Diversity requirements. The program also includes sections of writing, calculus, and physics. For more information on E-LEAP, contact the College of Engineering advisor at 801-585-7769.

Student Outreach

Engineering ambassadors represent their department on a college level and help with student recruitment and information sessions. Responsibilities may include presenting during Friday Afternoons in Engineering events, being ushers for College of Engineering Day, or visiting local high schools and junior highs. NSF representatives assist with similar outreach opportunities at college recruiting events and speaking engagements. Contact Cynthia Furse at cfurse@ece.utah.edu for more information about NSF opportunities.

Engineering Floor

The College of Engineering Living & Learning Community offers residents the opportunity to live with other students in the College of Engineering who share their academic and career goals.
UNDERGRADUATE ADVISING

The School of Computing undergraduate academic advisors are available to answer questions regarding schedule plans, registration for computer science classes, degree requirements, or any problems the student may be experiencing in their academic progress. Students should visit their academic advisor at least once a year to verify that they are on track for graduation. Appointments are required. The School of Computing receptionist will be happy to set up an appointment for you to meet with your undergraduate academic advisor.

The School has a faculty advisor who can also answer questions about any of the above, as well as more technical issues, such as career decisions and equivalence of transfer classes.

University College advisors are available on campus to assist students with additional majors or minors, and answer questions about general education and bachelor degree requirements. They are located in the Student Services Building, room 450. Appointments to see a University College advisor may be made by calling 801-581-8146 to set up a general advising appointment.

Mandatory Advising

Students will need to make mandatory advising appointments once during the freshmen year, the second year, and again in order to apply for graduation. It is advised to do so early to ensure timely registration. Any student who is still undeclared into a major by the completion of 60 credits will be required to meet with an advisor to declare a major or pre-major.

School of Computing Advisors

<table>
<thead>
<tr>
<th>School of Computing Advisors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Undergraduate Advisor (A-K)</strong></td>
</tr>
<tr>
<td>Kelly Olson</td>
</tr>
<tr>
<td>MEB 3190</td>
</tr>
<tr>
<td><a href="mailto:kelly@cs.utah.edu">kelly@cs.utah.edu</a></td>
</tr>
<tr>
<td>Call 801-581-8224</td>
</tr>
<tr>
<td>for an appointment</td>
</tr>
<tr>
<td><strong>Undergraduate Advisor (L-Z)</strong></td>
</tr>
<tr>
<td>Vicki Jackson</td>
</tr>
<tr>
<td>MEB 3190</td>
</tr>
<tr>
<td><a href="mailto:vicki@cs.utah.edu">vicki@cs.utah.edu</a></td>
</tr>
<tr>
<td>Call 801-581-8224</td>
</tr>
<tr>
<td>for an appointment</td>
</tr>
<tr>
<td><strong>Master’s Degree Advisor</strong></td>
</tr>
<tr>
<td>Anne Carlstrom</td>
</tr>
<tr>
<td>MEB 3190</td>
</tr>
<tr>
<td><a href="mailto:annc@cs.utah.edu">annc@cs.utah.edu</a></td>
</tr>
<tr>
<td>801-581-7631</td>
</tr>
<tr>
<td><strong>Undergraduate Director</strong></td>
</tr>
<tr>
<td>H. James de St. Germain</td>
</tr>
<tr>
<td>MEB 3190</td>
</tr>
<tr>
<td><a href="mailto:germain@cs.utah.edu">germain@cs.utah.edu</a></td>
</tr>
<tr>
<td>801-585-3352</td>
</tr>
</tbody>
</table>
EMPLOYMENT OPPORTUNITIES

The School of Computing employs a number of junior and senior students as teaching assistants. This job involves no more than 20 hours of work per week at an appropriate hourly wage. Appointments are made each semester based on student applications, which should be submitted prior to the start of each term. These applications are available on the CS website.

General inquiries are received regularly from local industry and from University research groups for students for full or part-time employment. These opportunities are posted to the CS jobs board via the Undergraduate link on the CS home page. Project-based opportunities, such as Website development and/or tutoring are also posted.

Students seeking employment upon graduation should contact the University Office of Career Services in order to be included on a list supplied to employers. Students not planning to work toward an advanced degree should register with Career Services during their junior year, since most companies begin interviewing during the fall semester. Each year, Career Services hosts a general career fair each semester, as well as a separate Science and Engineering Fair in the fall. Computer Science students are encouraged to attend both fairs to begin networking and interviewing with potential employers.

ENGINEERING TUTORING CENTER

First and second year engineering students frequently take a heavy class load of chemistry, physics, and calculus. Even the best students need a little help with these subjects from time to time. The College of Engineering Tutoring Center is staffed with junior and senior engineering students that offer academic help as well as experience.

Open tutoring labs are available throughout the week in WEB 1622. Schedules are posted weekly on the whiteboard in this room. More information on tutoring hours and availability can be found at www.eng.utah.edu/tutoring.

JOHN LALONDE UNDERGRADUATE LOUNGE

The School of Computing offers a Undergraduate Lounge on the third floor in the Merrill Engineering Building for undergraduate computer science students. Students are encouraged to use this space to study or relax on campus. A fridge and microwave are available.