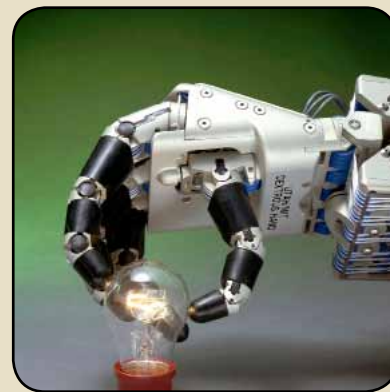
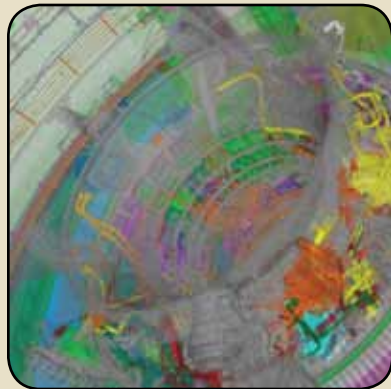


# Computer Science

## Undergraduate Student Handbook 2012-2013



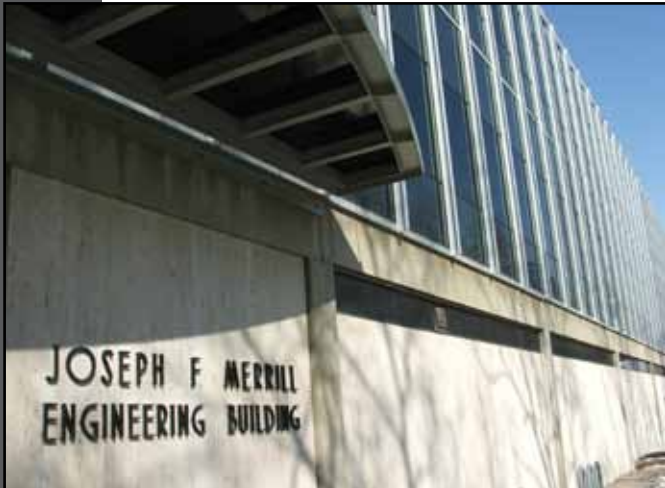
**SCHOOL OF COMPUTING**  
THE UNIVERSITY OF UTAH

50 S. Central Campus Drive MEB 3190 • Salt Lake City, Utah 84112  
801-581-8224 • 801-581-5843 (fax) • [www.cs.utah.edu](http://www.cs.utah.edu)



# Welcome to the School of Computing

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“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

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.

## 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

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.

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# Administration

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## Departmental Leadership

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Embedded/multi-core architecture, auto. domain specific architecture synthesis, VLSI, asynchronous circuits

Associate Director, School of Computing



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Natural language processing, information retrieval, and artificial intelligence

Associate Director, School of Computing



Ross Whitaker  
WEB 3464  
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Computer vision, visualization, and image processing

Office Manager



Karen Feinauer  
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## Undergraduate Program

Director, Undergraduate Studies



Jim de St. Germain  
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Artificial Intelligence, parallel computing, autonomous agents

Director, Educational Programs



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Application of computers to education

Director, Combined BS/MS Program



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Shape analysis, computer vision/image analysis, diffusion tensor image processing

Academic Advising Coordinator



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# Administration

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## Graduate Programs

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Scientific computing  
and visualization

Executive Director, Master Games Studio



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Director, Computer Engineering



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Computer architecture  
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Director, Robotics MS Track



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Robotics, teleoperation,  
virtual reality, and human  
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Director, Graphics/ Visualization Track



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Computer graphics, compu-  
tational geometry, geometric  
programming, solid modeling

Master's Advisor



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# Faculty

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## Director, Graduate Admissions



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Computer architecture: clustered processors, memory hierarchy bottlenecks

## Assistant Professor



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Computer graphics and animation

## Professor



Martin Berzins  
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Adaptive numerical methods, parallel algorithms, computational fluid and solid mechanics applications

## Professor & Dean, College of Engineering



Richard Brown  
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Microprocessor design, circuits to minimize leakage, solid-state chemical sensors.

## Professor



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Computer graphics, scientific visualization, geometric modeling, mechanical design

## Associate Professor



Matthew Flatt  
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Programming languages and systems

## Professor



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Medical image analysis

## Professor



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Dynamic formal verification of message passing (MPI), thread programs.

# Faculty

---

## Professor



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Optimization, parallelization and compilers

## Assistant Professor, Lecturer



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## Professor



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Visualization, computer graphics, parallel computation, computer vision

## Distinguished Professor



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Scientific computing, visualization, imaging, and problem solving environments

## Professor



Tom Henderson  
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Computer vision, mobile robotics

## Associate Professor



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Computer networks/systems, mobile systems and wireless networks, network security

## Professor



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## Assistant Professor



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# Faculty

---

Assistant Professor



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Visualization and large  
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Security, parallelism, verifi-  
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Embedded, real-time &  
operating systems, sensor  
networks, static analysis

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Programming languages,  
Computer memory systems  
and performance

Professor



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Computer graphics, geometric  
modeling, design

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machine learning

Professor



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Computer vision, visual  
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# Faculty/ Office Staff

---

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## School of Computing Staff

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### Accountant



Callie Martens  
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Phone: 587-3652  
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### Accountant



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# School of Computing Degrees

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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](http://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.

## Undergraduate Degrees

Bachelor of Science in Computer Science  
Bachelor of Science in Computer Engineering

## Undergraduate Minor

Computer Science

## Combined Degree Program

Bachelor's/ Master's Degree

## Graduate Degrees

Master's in Computer Science  
Non-Thesis Master's in Computer Science  
Master's in Computing

- Computer Engineering
- Data Management and Analysis
- Information Technology
- Game Engineering
- Graphics and Visualization
- Robotics

Ph.D. in Computer Science

Ph.D. in Computing

- Computer Engineering
- Graphics and Visualization
- Robotics
- Scientific Computing
- Data Management and Analysis

# School of Computing Degree Options

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## 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 (note that the math department requires a C or higher to advance to the next level of math) and a 3.0 GPA in order to be admitted to full major status. Students should also hold a 3.0 cumulative GPA in all classes.

### PRE-MAJOR REQUIREMENTS

All five courses are required in order to obtain full major status. You must earn a C- or better in each course, and a 3.0 average GPA among the following courses:

CS 1400 <sup>1</sup>	Intro to Computer Science	3 credits
CS 1410	Object-Oriented Programming	4 credits
CS 2420	Algorithms & Data Structures	4 credits
Math 1210	Calculus I	4 credits
Math 1220	Calculus II	4 credits

<sup>1</sup> CS 1400 may be waived by advanced students. Talk to the Director of Undergraduate Studies for the School of Computing for more information.

# Computer Science Full Major

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## 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.

# Computer Science Graduation Requirements

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## SCHOOL OF COMPUTING GRADUATION REQUIREMENTS

A minimum of 17 computer science 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; they may not be taken for CR/NC.

### GENERAL EDUCATION REQUIREMENTS

Regardless of your major, 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. The requirements for computer science 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 of 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

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## UNIVERSITY BACHELOR DEGREE REQUIREMENTS

The University graduation requirements for the Bachelor of Science degree are described in the University of Utah General Catalog.

- 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 pre-requisite math courses in order to take the next math course.

Math 1210	Calculus I	4 credits
Math 1220	Calculus II	4 credits
Math 2210	Calculus III	3 credits
Physics 2210	Physics for Scientists and Engineers I	4 credits
One required math elective must be selected from the following two options:		
Math 2270 <sup>1</sup>	Linear Algebra	4 credits
CS 3130 <sup>2</sup>	Engineering Probability and Statistics	3 credits
Two additional math/ science courses, each of which must be at least three semester hours, may be chosen from among the following:		
Any non-CS class from the Colleges of Engineering, Mines, or Science that requires Calculus II as a prerequisite or corequisite. <sup>3</sup>		
Physics 2220	Physics for Scientists and Engineers II	4 credits

<sup>1</sup> 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.

<sup>2</sup> 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 an elective.

<sup>3</sup> 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

COMPUTER SCIENCE MAJOR REQUIREMENTS		
CS 1400	Intro to Computer Science	3 credits
CS 1410	Intro to Object-Oriented Programming	4 credits
CS 2420	Intro to Algorithms & Data Structures	4 credits
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	4 credits
CS 4400	Computer Systems	4 credits
Theory restricted elective. One of the following must be completed:		
CS 3100	Models of Computation	3 credits
CS 3200	Scientific Computing	3 credits
Seven CS elective classes: See next page for rules and restrictions		
Capstone requirement: Choose one <sup>1</sup>		
<p><b>CS 4500:</b> 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. It is also highly recommended for seniors to enroll in the Senior Capstone Design pre-project course, during the fall prior to taking CS 4500.</p>		
<p><b>CS 4970:</b> 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.</p>		
CS 4500	Senior Capstone Project	3 credits
CS 4970	Bachelor's Thesis	3 credits

<sup>1</sup> CS 4515-EAE Senior Project II may be accepted as an alternate senior capstone project. Special permission is required by the EAE director for non-EAE students to enroll.

# Computer Science Elective Requirements

## CS Elective Requirements

Seven CS electives (3+ credits each), 3000-level or higher are required for the regular CS track. See track elective suggestions (following page) for suggestions or see the CS academic advisor.

Six (6) full CS courses (3-4 cr) must be taken.

The 7th course may be any combination of Senior Capstone Design, CS 3011, CS 3020, CS 4010, CS 4190 or CS 5040 (up to three credits). Four-credit classes cannot be combined with one or two-credit courses to equal the final elective.

Students should be aware of required pre-requisites and plan early for registration in desired electives. See additional requirements/restrictions below.

ACCEPTED	NOT ACCEPTED
<ul style="list-style-type: none"> <li>• One (1) independent study course (CS 4950), with approval</li> <li>• One (1) internship course (CS 4010), with approval</li> <li>• Only two (2) EAE specialty courses (such as, but not limited to: CS 3650, CS 3660, CS 4055, CS 4060, Character Rigging) may be counted</li> <li>• CS 4510 with approval from the EAE director</li> <li>• CS/ECE cross-listed electives</li> <li>• Grad-level CS courses may be accepted with permission of the professor. See the advisor to adjust the DARS.</li> </ul>	<ul style="list-style-type: none"> <li>• CS 5010, 5020 and seminars</li> <li>• Non-CS courses</li> <li>• Any course taken for CR/NC</li> <li>• CS 3130 may not be used as a CS elective <i>unless</i> the student's math/science requirements have already been fulfilled. See advisor.</li> <li>• CS major requirements: CS 2100, 3500, 3505, 3810, 4150, 4400, CS 3100 or 3200 (unless both are taken, then one will count as an elective), CS 4500, 4515, 4970</li> <li>• Grad-level CS courses that will be counted as part of a MS or Ph.D. degree</li> </ul>

# Undergraduate Track Elective Suggestions

<b>Software</b>	<p><u>Software Development</u>            4230: Parallel Programming            4480: Computer Networks            4540: Web Software Architecture            5460: Operating Systems            5470: Compilers            5530: Database Systems            5540: Human Computer Interaction            5785: Adv. Embedded Software            5xxx: Data Mining            5xxx: Scripting Language/Design</p> <p><u>Web/Mobile Development</u>            4540: Web Software Architecture            4480: Computer Networks            5530: Database Systems            5540: Human Computer Interaction            5xxx: Scripting Language/Design            5xxx: iPhone/Android Development</p>	<b>Computer Systems</b>	<p><u>Computer Systems</u>            4230: Parallel Programming            4480: Computer Networks            5460: Operating Systems            5470: Compilers            5530: Database Systems</p> <p><u>Programming Languages</u>            5100: Foundations of CS            5470: Compilers            5510: Programming Languages            5xxx: Scripting Language/Design</p>
	<b>Hardware</b>		<p><u>Computer Organization</u>            3700: Digital System Design            3710: Computer Design Lab            5460: Operating Systems            5710: Digital VLSI Design            5830: VLSI Architecture</p> <p><u>Embedded Systems</u>            3710: Computer Design Lab            4480: Computer Networks            5470: Compilers            5780: Embedded System Design            5785: Adv. Embedded Software            5789: Embedded Sy/Kinetic Art</p> <p><u>CAD for Digital Systems</u>            5710: Digital VLSI Design            5740: Computer-Aided Design            5745: Testing/Verif. Digital Circuits            5750: Synthesis/Veri. VLSI Sys.            5830: VLSI Architecture</p>
<b>Data</b>	<p><u>Information</u>            5300: Artificial Intelligence            5350: Machine Learning            5530: Database Systems            5xxx: Data Mining</p>	<b>Graphics/ EAE</b>	<p><u>Visual Computing</u>            3200: Intro Sci Comp            4640: Image Processing Basics            5320: Computer Vision            5350: Machine Learning            5600: Intro Computer Graphics            5610: Interactive Comp Graph            5630: Scientific Visualization            5650: Perception for Graphics</p> <p><u>EAE Courses (2 allowed as electives)</u>            3650: 3D Modeling            3660: Machinima            4055: Adv. 3D Modeling            4060: Digital Figure Sculpting            5xxx: Character Rigging</p>

# CS Degree Requirements

## 2012-2013 B.S. Degree Requirements

### PRE-MAJOR REQUIREMENTS:

Required in order to apply for full major status: C- or better in each course, and a minimum 3.0 average GPA (overall and among the following courses):

1. CS 1400, Intro. to CS \_\_\_\_\_ (3-F/S/U)
2. CS 1410, Object-Orient. Prog. \_\_\_\_\_ (4-F/S)
3. CS 2420, Algrthms/Data Struct. \_\_\_\_\_ (4-S/U)
4. Math 1210, Calculus I (QR) \_\_\_\_\_ (4)
5. Math 1220, Calculus II (QR) \_\_\_\_\_ (4)

### GENERAL EDU. REQUIREMENTS:

1. Wrtg 2010 (WR2) \_\_\_\_\_ (3)  
(Honor 2211 will also be accepted)
2. Wrtg 3012 or 3014 or 3015 (CW) \_\_\_\_\_ (3)  
(Honor 3200 will also be accepted)
3. American Institutions (AI) \_\_\_\_\_ (3)  
(Choose ONE: Econ 1740, Hist 1700, PoIS 1100, Honor 2212)

A total of **SIX** courses, two courses from each area, must be taken: Fine Arts, Humanities, Social/Behavioral Science. TWO of those six classes **must** be upper division (3000-level or above), ONE must satisfy the University Diversity requirement and ONE must satisfy the University International requirement.

4. Fine Arts (FF): \_\_\_\_\_ (3)
5. Fine Arts (FF): \_\_\_\_\_ (3)
6. Humanities (HF): \_\_\_\_\_ (3)
7. Humanities (HF): \_\_\_\_\_ (3)
8. Social/Behavioral Science (BF): \_\_\_\_\_ (3)
9. Social/Behavioral Science (BF): \_\_\_\_\_ (3)

- Upper Division \_\_\_\_\_
- Upper Division \_\_\_\_\_
- Diversity (DV) \_\_\_\_\_
- International (IR) \_\_\_\_\_

### MATH / SCIENCE ELECTIVES:

C- or better required in all math/ science courses. The two additional electives must be 3+ credits each, and qualify as follows:

*Accepted:* Math, science or engineering courses with Math 1220 as a pre- or co-requisite (See DARS). Biol 1210, Chem 1210 also accepted.

*Not Accepted:* CS courses (with the exception of CS 3130). Math 2200. Math 2250 not accepted if Math 2270 and/ or Math 2280 are taken. Math 5010 and/or 3070 not accepted if CS 3130/ ECE 3530 is taken.

1. Physics 2210, Physics I \_\_\_\_\_ (4)
2. Math 2210, Calculus III (QR) \_\_\_\_\_ (3)
3. Math 2270 (QR) or CS 3130 (QI) \_\_\_\_\_ ( )
4. \_\_\_\_\_ ( )
5. \_\_\_\_\_ ( )

### The following requirements are restricted to FULL Majors:

C- or better required in all CS courses. 2.5 GPA (overall & among CS courses) required to graduate.

### MAJOR REQUIREMENTS:

1. CS 2100, Discrete Structures \_\_\_\_\_ (3-F,S)
2. CS 3500, Software Practice I \_\_\_\_\_ (4-F)
3. CS 3505, Software Practice II \_\_\_\_\_ (3-S)
4. CS 3810, Computer Organization (QI) \_\_\_\_\_ (4-F)
5. CS 4150, Algorithms (QI) \_\_\_\_\_ (3-S)
6. CS 4400, Computer Systems (QI) \_\_\_\_\_ (4-F)

### CS ELECTIVES:

Choose seven (7) CS courses, 3000-level or above. Each must be at least 3 credits.

*Accepted:* Only one Independent Study and one Internship (max. 3 credits each) allowed. Any combination of CS 3011, CS 3020, CS 5040, CS 4190 or Senior Capstone Design can be combined to fulfill one elective (up to three credits). Only two EAE specialty courses (CS 3650, 3660, 4055, 4060) may be taken for elective credit.

*Not Accepted:* Seminars. CS 3130. Any CS courses taken for a CR/NC grade.

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

### THEORY RESTRICTED ELECTIVE

Choose ONE: (If both classes are taken, one will count as a CS elective above)

- CS 3100, Models of Computation (QI) \_\_\_\_\_ (3-F)  
or  
CS 3200, Scientific Computing \_\_\_\_\_ (3-S)

### CAPSTONE REQUIREMENT:

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

- \*CS 4500, Senior Capstone Project \_\_\_\_\_ (3-S)  
or  
CS 4970, Bachelor's Thesis \_\_\_\_\_ (3)

\*If selecting CS 4500, it is highly recommended that you take CS 4960-Senior Capstone Design (1 cr) in prior fall semester.

# CS Suggested Course Outline

The CS degree can be completed in four full-time years if the student can take the pre-major courses during freshman year. 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 or an alternate five-year plan.

**\*In order to take CS 1410 during the freshman fall semester, students must pass a proficiency test to waive CS 1400. If 1400 is needed, students may take CS 1400 fall semester, 1410 in the spring and CS 2420 in the summer semester to stay on track.**

	Fall Semester	Spring Semester
Freshman (27 credits)	CS 1400 (or CS1410*) 3 Math1210 Calc I 4 General Education course 3 General Education course 3 <hr/> (13)	CS1410 (or CS2420*) 4 Math1220 Calc II 4 American Institutions course 3 Wrtg2010 Writing 3 <hr/> (14)
Summer - if needed - (7 credits)	CS 2420 Intro to Algorithms & Data Structures 4 Math2210 Calculus III 3 <hr/> (7)	
Sophomore (27 credits)	CS3500 Software Prac. I 4 CS3810 Comp. Org. 4 Math required elective 3 General Education course 3 <hr/> (14)	CS2100 Discrete 3 CS3505 Software Prac. II 3 Phys2210 Physics I 4 Wrtg3012, 3014 or 3015 3 <hr/> (13)
Junior (29 credits)	CS4400 Comp. Systems 4 CS elective 3 CS elective 3 General Education course 3 <hr/> (13)	CS4150 Algorithms 3 CS3200 Theory elective <sup>1</sup> 3 CS elective 3 Math/ Science elective 4 General Education course 3 <hr/> (16)
Senior (32 credits)  <i>122 total credits</i>	CS elective 3 CS elective 3 CS elective 3 International requirement 3 General Education course 3 <hr/> (15)	CS4500 Capstone <sup>2</sup> 3 CS elective 3 Math/ Science elective 4 3000-level Diversity course 3 Free elective (if needed**) 4 <hr/> (17)

<sup>1</sup> If both CS 3100 and CS 3200 are taken, the second will count as a CS elective. CS 3100 is offered in the fall.

<sup>2</sup> The thesis option requires special permission from the faculty. This option is intended for students who are considering graduate school.

\*\* Free elective only needed if student has not yet reached the 122 total credit hours required to graduate.

# Entertainment Arts and Engineering Program

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## 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.

# Entertainment Arts and Engineering Program

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 pre-requisite math courses in order to take the next math course.		
Math 1210	Calculus I	4 credits
Math 1220	Calculus II	4 credits
Math 2210	Calculus III	3 credits
Physics 2210	Physics for Scientists and Engineers I	4 credits
ECE 3530 or CS 3130	Engineering Probability and Statistics Engineering Probability and Statistics	3 credits 3 credits
One additional course, at least three hours, may be chosen from the following:		
Math 2270 <sup>1</sup>	Linear Algebra	4 credits
Any non-CS class from the Colleges of Engineering, Mines, or <sup>1</sup> Science that requires Calculus II as a prerequisite or corequisite		
Biol 1210	Principles of Biology	4 credits
Chem 1210	General Chemistry I	4 credits
Physics 2220	Physics for Scientists and Engineers II	4 credits

<sup>1</sup> 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.



# Entertainment Arts and Engineering Program

## COMPUTER SCIENCE EAE MAJOR REQUIREMENTS

A minimum of 18 computer science classes must be taken. Ten CS classes (30 credits) must be taken at the U of U. A student may repeat upper-division courses (3000-level or above) only once. All computer science classes taken to satisfy degree requirements must be taken for a letter grade; they may not be taken for CR/NC.

CS 1400	Intro to Computer Science	3 credits
CS 1410	Intro to Object-Oriented Programming	4 credits
CS 2420	Intro to Algorithms & Data Structures	4 credits
CS Core Requirements (Full majors only)		
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
EAE required CS courses		
CS 3650	3D Modeling	3 credits
CS 3660	Machinima	3 credits
CS 5300	Artificial Intelligence	3 credits
<u>CHOOSE ONE:</u>		
CS 5460	Operating Systems	4 credits
CS 5470	Compilers	4 credits
CS 5530	Databases	3 credits
Theory restricted elective. Students must choose one of the following:		
<u>CHOOSE ONE:</u>		
CS 3200	Scientific Computing	3 credits
CS 3100	Models of Computation	3 credits

## Entertainment Arts and Engineering Program

Film requirements. The following classes are required:		
FILM 2700	Survey of Videogame Theory	3 credits
FILM 3500	Film Production I	4 credits
Series requirement. One of the following series must be taken (junior year):		
COMPUTER ANIMATION SERIES:		
FILM 2610	Computer Animation I	4 credits
FILM 2620	Computer Animation II	4 credits
GAME DEVELOPMENT SERIES:		
FILM 3710	Game Develop: Historical, Traditional	4 credits
FILM 3720	Game Develop: Contemporary	4 credits
Additional suggested elective (not required). This courses will not count toward EAE degree requirements, but may count toward the required 122 University credits:		
FA 3350	Intro to 3D Computer Graphics	3 credits
EAE computer science elective. Any CS elective 4000 level or above will be accepted. <sup>1</sup> One of the following classes is <i>recommended</i> :		
CS 4540	Web Software Architecture	3 credits
CS 4480	Computer Networks	3 credits
CS 5350	Machine Learning	3 credits
CS 5600	Intro to Graphics	3 credits
Capstone requirement. Both of the following courses are required:		
CS 4510	Senior Project I	3 credits
CS 4515	Senior Project II	3 credits

<sup>1</sup> Must be 3-4 credits. Excludes CS 4055, CS 4060, CS 4500, and CS seminars.

# EAE Degree Requirements

2012-2013 B.S. Degree Requirements Updated 9/18/12

## PRE-MAJOR REQUIREMENTS:

Required for full major status: C- or better in each course, and a minimum 3.0 average GPA (overall & among the following courses):

1. CS 1400, Intro. to CS \_\_\_\_\_ (3-F/S/U)
2. CS 1410, Object-Orient. Prog. \_\_\_\_\_ (4-F/S)
3. CS 2420, Algrthm/Data Struct. \_\_\_\_\_ (4-S/U)
4. Math 1210, Calculus I (QR) \_\_\_\_\_ (4)
5. Math 1220, Calculus II (QR) \_\_\_\_\_ (4)

## GENERAL EDU. REQUIREMENTS:

Honors options also accepted for WR2, CW, and AI requirements.

1. Wrtg 2010 (WR2) \_\_\_\_\_ (3)
2. FA 3600 (CW) \_\_\_\_\_ (3)
3. American Institutions (AI) \_\_\_\_\_ (3)

A total of **SIX** courses must be taken (two from each) in the following areas: Fine Arts, Humanities, Behavioral/Social Science. TWO of those six classes **must** be upper division (3000 level or above), ONE must satisfy the University Diversity requirement and ONE must satisfy the University International requirement.

4. **ART 1020** Basic Drawing (FF): \_\_\_\_\_ (3)
5. Fine Arts (FF): \_\_\_\_\_ (3)
6. Humanities (HF): \_\_\_\_\_ (3)
7. Humanities (HF): \_\_\_\_\_ (3)
8. Social/Behavioral Science (BF): \_\_\_\_\_ (3)
9. Social/Behavioral Science (BF): \_\_\_\_\_ (3)
  - Upper Division 1 \_\_\_\_\_
  - Upper Division 2 \_\_\_\_\_
  - Diversity (DV) \_\_\_\_\_
  - International (IR) \_\_\_\_\_

## MATH / SCIENCE ELECTIVES:

C- or better required in all math/ science courses.

ONE additional math/science elective is required (at least three credits). Choose any non-CS math or science class with Math 1220 (Calculus II) as a pre- or co-requisite. Physics 2220 will also be accepted. **Math 2200, 5010, 3070 not allowed.**

1. Physics 2210, Physics I \_\_\_\_\_ (4)
2. Math 2210, Calc III (QR) \_\_\_\_\_ (3)
3. CS 3130, Eng Prob & Stats (QI) \_\_\_\_\_ (3)
4. \_\_\_\_\_ ( )

## FILM REQUIREMENTS:

1. FILM 2700, Intro to Video Games \_\_\_\_\_ (3)
2. FILM 3500, Film Production \_\_\_\_\_ (4)

## The following requirements are restricted to FULL Majors:

C- or better required in all CS courses. 2.5 GPA (overall & among CS courses) required to graduate.

## MAJOR REQUIREMENTS:

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

## EAE REQUIREMENTS:

1. CS 3650, 3D Modeling \_\_\_\_\_ (3-F)
2. CS 3660, Machinima \_\_\_\_\_ (3-S)
3. CS 5300, Artificial Intelligence \_\_\_\_\_ (3-S)
4. CS 5530, Databases \_\_\_\_\_ (3-S)
5. Choose ONE: (If both classes are taken, one counts as the CS elective below)
  - CS 5460, Operating Systems \_\_\_\_\_ (4-S)
  - or
  - CS 5470, Compilers \_\_\_\_\_ (4-S)

## CS ELECTIVE

Choose ONE: 4000+ level CS course (3 cr). Seminars, CS 4055, CS 4060, CS 4500 may **not** be counted. (Suggested: CS 4480, 4540, 5150, 5350, 5600, 5630)

1. \_\_\_\_\_ (3)

## SERIES REQUIREMENT:

Choose ONE:

### ANIMATION SERIES

- FILM 3610, Computer Animation I \_\_\_\_\_ (4-F)
- FILM 3620, Computer Animation II \_\_\_\_\_ (4-S)

or

### GAME DESIGN SERIES

- FILM 3710, Game Design I \_\_\_\_\_ (4-F)
- FILM 3720, Game Design II \_\_\_\_\_ (4-S)

## THEORY RESTRICTED ELECTIVE

Choose ONE:

- CS 3100, Models of Computation (QI) \_\_\_\_\_ (3-F)
- or
- CS 3200, Scientific Computing \_\_\_\_\_ (3-S)

## CAPSTONE REQUIREMENT

1. CS 4510, Senior Project I \_\_\_\_\_ (3-F)
2. CS 4515, Senior Project II \_\_\_\_\_ (3-S)

# EAE Suggested Course Outline

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. 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.

**\*In order to take the EAE-CS 1410 course during the freshman fall semester, students must pass a proficiency test to waive CS 1400. If 1400 is needed, EAE students may take CS 1400 fall, and the regular 1410 and CS 2420 courses spring and summer semesters to stay on track.**

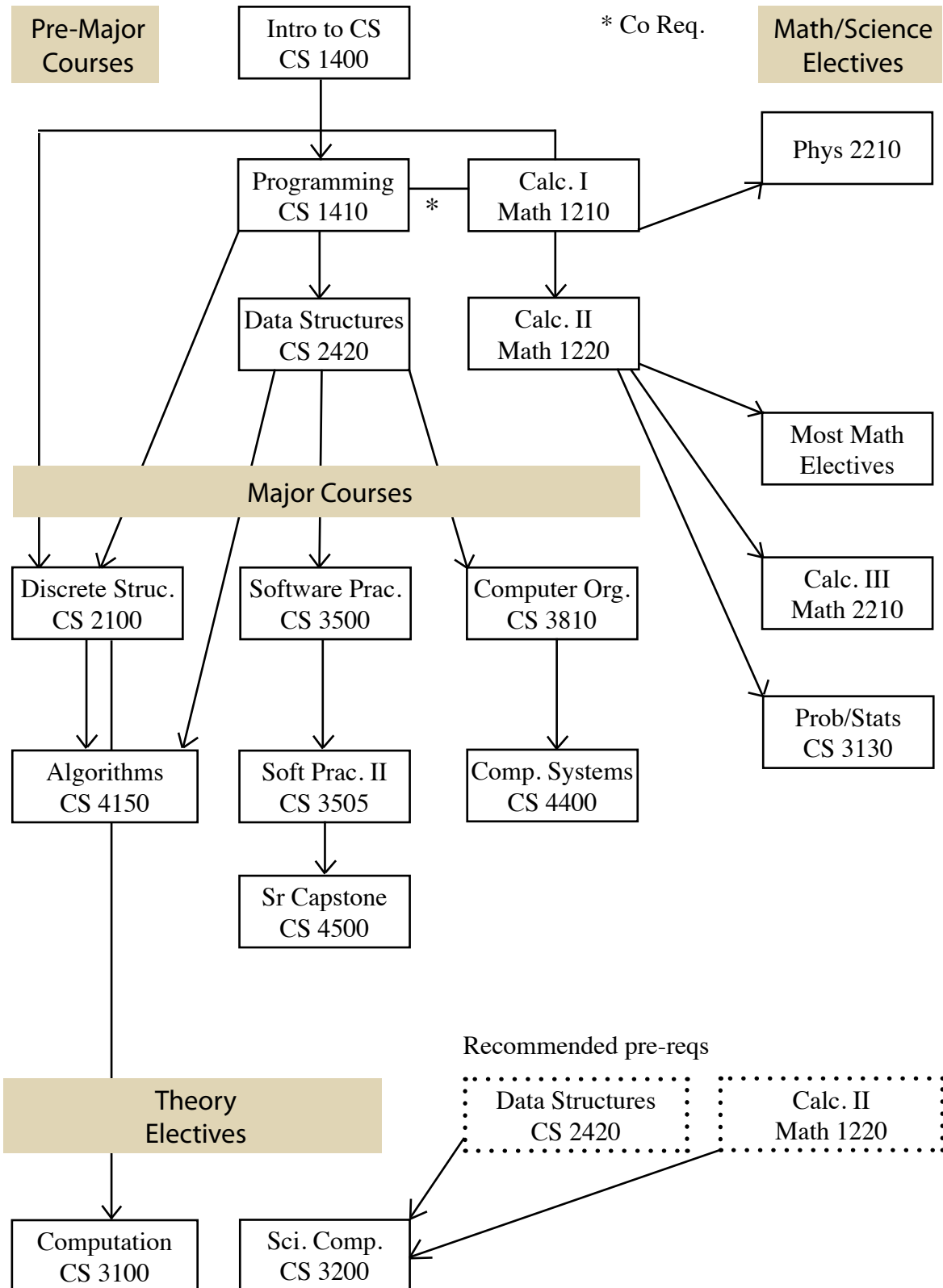
	Fall Semester			Spring Semester		
Freshman (27 credits)	CS1400 (or CS 1410*)		3	CS1410 (or CS 2420*)		4
	Math1210	Calc I	4	Math1220	Calc II	4
	Art1020	Basic Drawing	3	Wrtg2010	Writing	3
	General Education course		3	Film 2700	Video Games	3
			(13)			(14)
Summer - if needed - (7 credits)	CS 2420	Intro to Algorithms & Data Structures				4
	Math2210	Calculus III				3
			(7)			(7)
Sophomore (31 credits)	CS3500	Software Prac. I	4	CS3505	Software Prac. II	3
	CS3650	3D Modeling	3	CS3660	Machinima	3
	CS3810	Comp. Org.	4	Phys2210	Physics I	4
	FILM3500	Film Production	4	FA3600	Wrtg New Media	3
			(15)	American Institutions course		3
			(16)			(16)
Junior (30 credits)	CS2100	Discrete	3	CS3200	Scientific Comp. <sup>1</sup>	3
	CS4400	Comp. Systems	4	CS4150	Algorithms	3
	CS 3130	Eng. Prob. & Stats	3	CS5530	Databases	3
	EAE Series: Animation/Game I		4	EAE Series: Animation/Game II		4
			(14)	Gen Ed/Bachelor Degree Req.		3
			(16)			(16)
Senior (29 credits)	CS4510	Senior Project I	3	CS4515	Senior Project II	3
	CS5460	Operating Syst. <sub>2</sub>	4	CS5300	A.I.	3
	Math/science elective		4	CS elective		3
	Gen Ed/Bachelor Degree Req.		3	General Education course		3
			(14)	General Education course		3
<i>124 total credits</i>			(14)			(15)

<sup>1</sup> CS 3200 is the recommended theory course, but CS 3100 (fall semester) will also be accepted.

<sup>2</sup> CS 5460 is recommended, but CS 5470 will also be accepted. CS 5470 is offered in the spring.

See the departmental advisor for suggested changes to this sequence or an alternate five-year plan.

# Prereq Core Course Requirements



# Continuing Performance

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## PERFORMANCE REQUIREMENTS

All computer science, science, engineering, and writing courses taken to satisfy the major requirements must be taken for a 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. A student may repeat required courses for the major once only (pre-major courses may be taken as many times as necessary to gain full-major status).



## 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.

## 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 five years of acceptance as a full major, a student may request an extension and submit a revised schedule of completion.

## 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 "request for evaluation" 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: <http://admissions.utah.edu/special-credit/advanced-placement-credit.php>.

## MATH PLACEMENT

Math placement depends on an Accuplacer test score, AP math score, or previous transfer work. Accuplacer and AP 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 Student Services Building).

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

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

# Advanced Placement

## MATH PLACEMENT CONTINUED

Pre-Requisite Requirements	Math Course Placement
AP AB score of 3 or higher ACT Math score of 28 or higher SAT Math score of 630 or higher Accuplacer CLM score of 95 or better	Math 1210 - Calculus I
AP AB score of 4 or higher AP BC score of 3 or higher	Math 1220 - Calculus II
AP BC score of 4 or higher	Math 2210 - Calculus III

## ADVANCED PLACEMENT EXAM COURSE EQUIVALENTS FOR COMPUTER SCIENCE

AP Exam	Required Score	U. Course Waived	Course Placement
Biology	4 or 5	Biol 1210	
Chemistry	4 or 5	Chem 1210	
Physics C: Mech	4 or 5	Phys 2210	Phys 2220
Physics C: E&M	4 or 5	Phys 2220	Phys 2210
Computer Science A Test	5	CS 1400/ 1410	CS 2420
	4	CS 1400	CS 1410



# Computer Science Minor

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## COMPUTER SCIENCE MINOR

The School of Computing offers a minor for students who desire to gain sufficient background to use and program computers in another field.

MINOR REQUIREMENTS		
The minor consists of a minimum of 21 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 <i>at</i> the University of Utah):		
CS 1400 <sup>1</sup>	Intro to Computer Science	3 credits
CS 1410	Intro to Object-Oriented Programming	4 credits
CS 2420	Intro to Algorithms & Data Structures	4 credits
MATH 1210	Calculus I	4 credits
CS 2100	Discrete Structures	3 credits
CS 3500*	Software Practice I	4 credits
CS Elective:* Students must take at least one additional CS class (3-4 credits) 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. Applications are accepted by the CS advisor in MEB 3190.

Students are admitted to the minor if their average grade in Math 1210, CS 1410, and CS 2420 is 3.0 or higher. They must also achieve a letter grade of C- or better in these courses.

<sup>1</sup> Students who are unprepared for 1410 will have to take the pre-requisite, CS 1400.

# 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
- The synchronization barrier between the degrees is broken. Hence, students may take graduate classes during their senior year, and undergraduate classes during their fifth 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 will normally constitute a portion of the master's thesis.

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 mid-May to the graduate advisor 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](http://www.cs.utah.edu/bsms).

# Scholarships

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## 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](http://www.cs.utah.edu). They must be submitted to the School's office 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 18 credit hours of resident tuition for two semesters. To be eligible, students must take at least 12 credit hours per semester, be U.S. citizens and have a cumulative GPA of 3.5 or higher.

**School of Computing Scholarships:** These are awards 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, the Eccles Foundation, Kiri Wagstaff, Dave Hanscom, Joan de St. Germain, and others. 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 Involvement

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## 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 the Associated Students of the University of Utah student group (ASUU) at [www.asuu.utah.edu](http://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 year.

### 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.

# Student Involvement

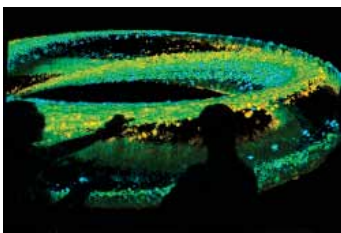
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## STUDENT PARTICIPATION IN THE SCHOOL OF COMPUTING

### Independent Study

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.

### Research



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. Visit [www.coe.utah.edu/current-undergrad/research](http://www.coe.utah.edu/current-undergrad/research) for more information.

### iPhone Association

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.uofiphone.com](http://www.uofiphone.com) for more information or to join.

### SoC UgSAC

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](http://csugsac.eng.utah.edu).

### Computer Science Club

The Utah Undergraduate Computer Science Club (UUCSC) provides undergraduate CS students the opportunity to network with peers, professionals, faculty and staff, and assists these students in developing their skills, understanding of, and passion for the field of computer science. For additional information, including meeting days and times, contact the School of Computing advisor.

# 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: [web.utah.edu/swe](http://web.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/current\\_undergrad/hie](http://www.coe.utah.edu/current_undergrad/hie). Students may also participate in the University's honor program through Honors College. For more information, please visit: [www.honors.utah.edu](http://www.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](mailto: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.



# Academic Support

## UNDERGRADUATE ADVISING

The School of Computing undergraduate academic advisor is 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 the academic advisor at least once a year to verify that they are on track for graduation. Appointments are required. The School of Computing receptionist (MEB 3190, 801-581-8224) will be happy to set up an appointment for you to meet with the 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.

### School of Computing Advisors

#### **Faculty Advisor**

H. James de St. Germain  
MEB 3190  
germain@cs.utah.edu  
801-585-3352

#### **Undergraduate Advisor**

Kelly Olson  
MEB 3190  
ugrad-help@cs.utah.edu  
801-581-8225  
Call 801-581-8224 for an appointment






#### **Master's Advisor**

Anne Carlstrom  
MEB 3190  
801-581-7631  
annc@cs.utah.edu

#### **Ph.D. Advisor**

Karen Feinauer  
MEB 3190  
801-585-3551  
karenf@cs.utah.edu

## Mandatory Advising Checkpoints at the University of Utah

	Freshmen & Transfer Orientation Advising
	Freshmen Advising
	Second Year Advising
	Undeclared Advising
	Graduation Advising

All new and transfer students are required to meet with an advisor before registering for classes. Additionally, students will need to make mandatory advising appointments once during their freshmen year, their second year, and again in order to apply for graduation. 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.

# Academic Support

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## University of Utah Undergraduate Advising Resources

### DEGREE AUDIT REPORT SYSTEM (DARS)

The Degree Audit Report System (DARS) is a tool that you can access any time from your CIS page to view your academic progress. Be sure to view your DARS often and speak to your advisor if you have any questions about its content. The DARS is used to clear students for graduation, so it is imperative that it is up-to-date and accurate.

You do not need to bring a printed DARS for an advising appointment; however, you may want to preview it before your appointment and prior to registration. If you are a pre-computer science major, choose the Generate Degree Audit Report link and select Computer Science (or CS-EAE).

If you are a declared full computer science major click on Generate Degree Audit Report for My Major(s). Your catalog year will be the year that you enter full major status. If you have difficulty understanding the DARS, view How to Read a DARS Report on your CIS page.

### GRADUATION PLANNING SYSTEM (GPS)

The Graduation Planning System (GPS) is a tool, available to all students, that allows you to plan what classes you want and need to take for your computer science degree at the University of Utah.

The School of Computing has provided a suggested four-year plan called a Road Map. Use this Road Map as created, or modify it to your liking, to create your own graduation plan from start to finish. You can access this tool and each department's Road Map from your CIS page.



# Academic Support

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## 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](http://www.eng.utah.edu/tutoring).

## STUDENT AFFAIRS

Student Affairs at the University of Utah offers student support resources ranging from health and wellness to counseling services and child care. For more information, please visit [www.sa.utah.edu](http://www.sa.utah.edu).





**SCHOOL OF COMPUTING**

THE UNIVERSITY OF UTAH

50 S. Central Campus Drive, Merrill Engineering Building (MEB) 3190, Salt Lake City, UT 84112