Computer Science

Undergraduate Student Handbook
2011-2012
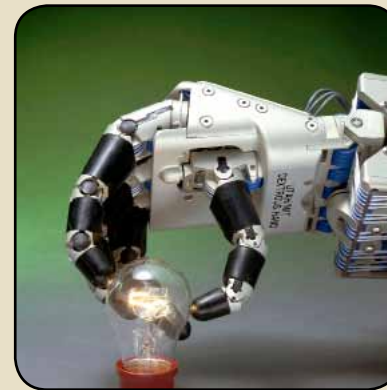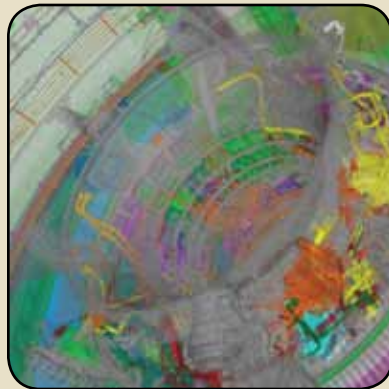
SCHOOL OF COMPUTING
THE UNIVERSITY OF UTAH

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 35 regular faculty members, two research faculty, and nine adjunct faculty, with more than 300 CS undergraduate students, 110 CE undergrads, 65 enrolled in the M.S. program and 100 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.

Table of Contents

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School of Computing Degrees

The School of Computing offers a Bachelor of Science degree in computer science. The undergraduate program begins with a set of four 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.

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

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.

School of Computing Degree Options

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 new 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 acheive 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 [1]	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

[1] 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

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 should be obtained from the School of Computing web page or office during the semester 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.

High-achieving freshmen may be offered full major status allowing them to be directly admitted into the computer science program at the University of Utah. Admission is determined by the freshman index score and application materials.

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.

Computer Science Graduation Requirements

SCHOOL OF COMPUTING GRADUATION REQUIREMENTS

A minimum of 18 computer science classes must be taken. Ten CS classes (30 credits) must be taken at the University of Utah. 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.

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

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 incorportaing the diveristy, 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 [1]	Linear Algebra	4 credits
ECE 3530 [2] or CS 3130	Engineering Probability and Statistics Engineering Probability and Statistics	3 credits 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. [3]		
Physics 2220	Physics for Scientists and Engineers II	4 credits

[1] Math 2250 covers the same material as Math 2270 and 2280, although in less depth. Hence, if 2270 is used as a required electives, 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 an 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

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, 3000-level or higher must be taken (21 credits total).		
• Seminars, CS 5010, 5020, and CS 4515 may not be counted. • Only (1) independent study and (1) internship may be counted with permission. • Any combination of Senior Capstone Design, CS 3011, CS 3020, CS 4190 or CS 5040 can be combined to fulfill one of these requirements (up to three credits). • Only two EAE specialty courses (such as, but not limited to: CS 3650, CS 3660, CS 4055, CS 4060) may be counted toward the required seven CS electives. • CS 3130 is designed to count as a math/science elective. It may not be used as a CS elective *unless* the student's math/science requirements have already been fulfilled.		
Capstone requirement. One of the following must be completed:		
CS 4500 [1]	Senior Capstone Project	3 credits
CS 4970	Bachelor's Thesis	3 credits

[1] It is highly recommended for seniors to enroll in Senior Capstone Design, a one-credit, pre-project course, during the fall prior to taking CS 4500.

CS Degree Requirements

2011-2012
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 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 _____(4)
5. Math 1220, Calculus II _____(4)

GENERAL EDU. REQUIREMENTS:

1. Wrtg 2010 (WR2) _____(3)
2. Wrtg 3012 or 3014 or 3015 (CW) _____(3)
(Honors 3200 will also be accepted)

3. American Institutions (AI) _____(3)
(Choose ONE: Econ 1740, Hist 1700, PolS 1100)

*A total of **SIX courses**, two courses from each area, must be taken: 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. 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 1   _____
- Upper Division 2   _____
- Diversity (DV)   _____
- International (IR)   _____

MATH / SCIENCE ELECTIVES:

Physics 2210 & Math 2210 required.
*Choose ONE required elective: Math 2270 or CS 3130/ ECE 3530.

TWO additional electives (3+ credits) required:

Accepted: Any math, science or engineering class with Math 1220 (Calculus II) as a pre- or co-requisite. Physics 2220, ECE 1270, Biol 1210, Chem 1210.

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, Calc III _____(3)
3. *Req. Elective_____
4. _____
5. _____

The following requirements are restricted to FULL Majors:

New majors are only admitted for fall semesters. Applications accepted spring and summer.

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, or CS 4190 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.

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 option)

*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.

(Number specifies credit amount, letter corresponds to semester offered)

F-Fall Semester
S-Spring Semester
U-Summer Semester   Updated 8/22/11

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

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

2 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

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 [1]	Linear Algebra	4 credits
Any non-CS class from the Colleges of Engineering, Mines, or Science that requires Calculus II as a prerequisite or corequisite	[1]	
Biol 1210	Principles of Biology	4 credits
Chem 1210	General Chemistry I	4 credits
Physics 2220	Physics for Scientists and Engineers II	4 credits

[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.

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

CHOOSE ONE:

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:

CHOOSE ONE:

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.[1] One of the following classes is *recommended*:		
CS 4540	Web Software Architecture	3 credits
CS 5480	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

[1] Must be 3-4 credits. Excludes CS 4055, CS 4060, CS 4500, and CS seminars.

EAE Degree Requirements

2011-2012 B.S. Degree Requirements *Updated 8/22/11*

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 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 _____ (4)
5. Math 1220, Calculus II _____ (4)

GENERAL EDU. 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:

Physics 2210, Math 2210 & CS 3130 are required.

*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 is not allowed**.*

1. Physics 2210, Physics I_____(4)
2. Math 2210, Calc III _____(3)
3. CS 3130, Eng Prob & Stats _____(3)
4. _____

FILM REQUIREMENTS:

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

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 may count as the CS elective below)*

   CS 5460, Operating Systems _____(4-S)

    or

   CS 5470, Compilers _____(4-S)

CS ELECTIVE

Choose ONE: 4000-level or above CS course (3-4 cr). Seminars, CS 4055, CS 4060, and CS 4500 may not be counted. (Suggested: CS 4540, 5150, 5350, 5480, 5600, 5630)

1. _____(3)

SERIES REQUIREMENT:

Choose ONE:

ANIMATION SERIES
   FILM 2610, Computer Animation I _____ (4-F)
   FILM 2620, 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.
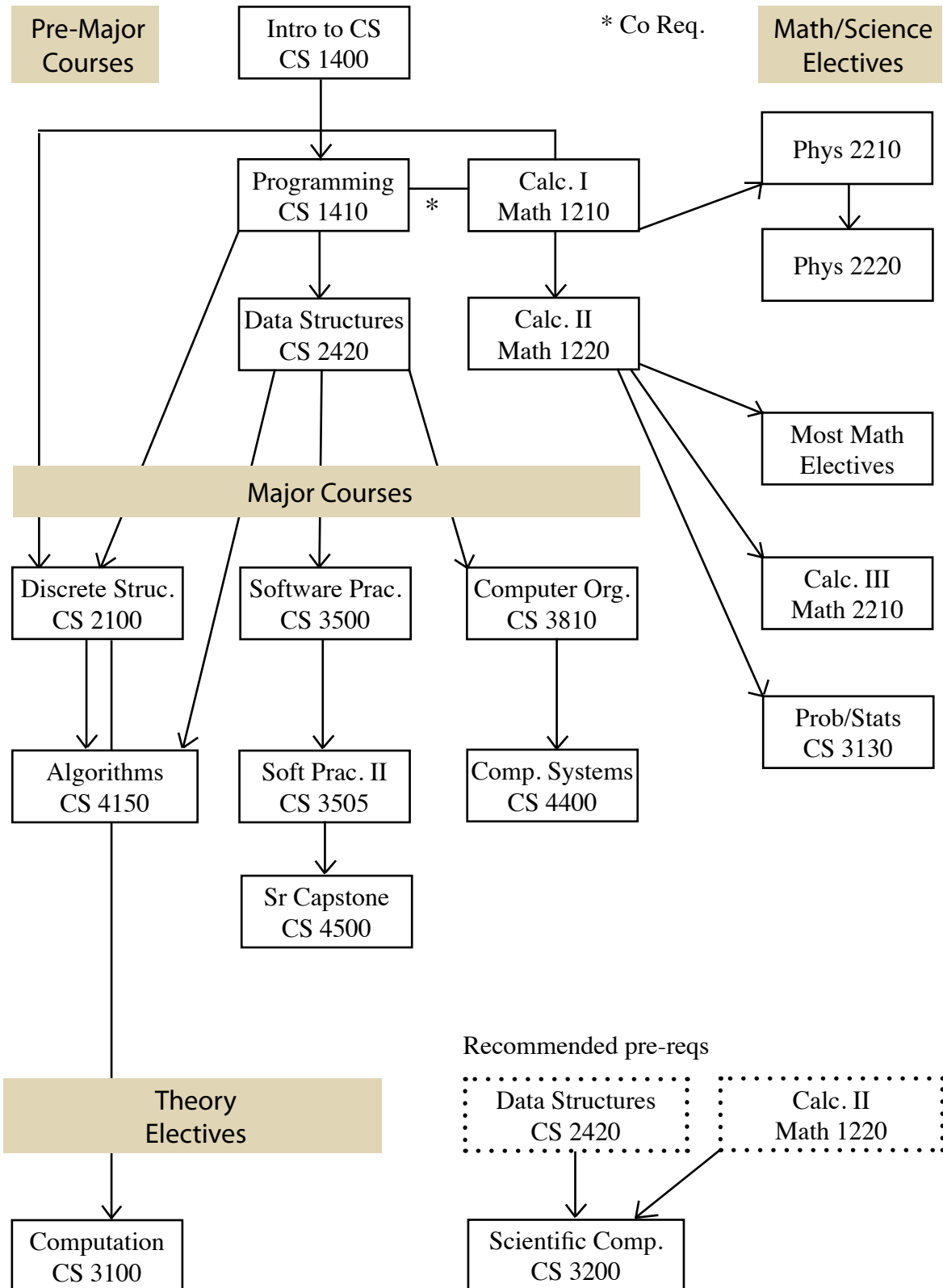
	Fall Semester	Spring Semester
Freshman **(27 credits)**	CS1400 (or CS 1410*) 3 Math1210 Calc I 4 Art1020 Basic Drawing 3 General Education course 3 (13)	CS1410 (or CS 2420*) 4 Math1220 Calc II 4 Wrtg2010 Writing 3 Film 2700 Video Games 3 (14)
Summer **(7 credits)**	CS 2420 Intro to Algorithms & Data Structures 4 Math2210 Calculus III 3 (7)	
Sophomore **(31 credits)**	CS3500 Software Prac. I 4 CS3650 3D Modeling 3 CS3810 Comp. Org. 4 FILM3500 Film Production 4 (15)	CS3505 Software Prac. II 3 CS3660 Machinima 3 Phys2210 Physics I 4 FA3600 Wrtg New Media 3 American Institutions course 3 (16)
Junior **(30 credits)**	CS2100 Discrete 3 CS4400 Comp. Systems 4 CS 3130 Eng. Prob. & Stats 3 EAE Series: Animation/Game I 4 (14)	CS3200 Scientific Comp.[1] 3 CS4150 Algorithms 3 CS5530 Databases 3 EAE Series: Animation/Game II 4 Gen Ed/Bachelor Degree Req. 3 (16)
Senior **(29 credits)** **124 total credits**	CS4510 Senior Project I 3 CS5460 Operating Syst.[2] 4 Math/science elective 4 Gen Ed/Bachelor Degree Req. 3 (14)	CS4515 Senior Project II 3 CS5300 A.I. 3 CS elective 3 General Education course 3 General Education course 3 (15)

[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.

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

Prereq Core Course Requirements

Pre-Major Courses

Intro to CS CS 1400

* Co Req.

Math/Science Electives

Programming CS 1410

*

Calc. I Math 1210

Phys 2210

Phys 2220

Data Structures CS 2420

Calc. II Math 1220

Most Math Electives

Major Courses

Discrete Struc. CS 2100

Software Prac. CS 3500

Computer Org. CS 3810

Calc. III Math 2210

Algorithms CS 4150

Soft Prac. II CS 3505

Comp. Systems CS 4400

Prob/Stats CS 3130

Sr Capstone CS 4500

Recommended pre-reqs

Theory Electives

Data Structures CS 2420

Calc. II Math 1220

Computation CS 3100

Scientific Comp. CS 3200

Continuing Performance

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: www.sa.utah.edu/admiss/AP.html.

MATH PLACEMENT

    Math placement depends on your Accuplacer test score, your AP math score, or your previous transfer work. Your Accuplacer and AP scores are valid for two years after the test is taken. If you wish to challenge your placement score you may take a math placement exam at the Testing Center (801-581-8744, 498 Student Services Building). The fee for the math placement exam is $15. Accuplacer exam scores place into the following math courses: (Note: Three Accuplacer exam scores are used, Arithmetic (AR), Elementary Algebra (EA) and College Level Math (CLM).

Accuplacer Score	Math Course Placement
$20 < AR < 120$ or $EA < 54$	Math 990 - Elementary Algebra
$EA >= 54$	Math 1010 - Intermediate Algebra
$CLM >= 60$	Math 1050 & Math 1060 - College Algebra & Trigonometry
$CLM >= 95$	Math 1210 - Calculus I

Advanced Placement

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
Calculus AB Test	4 or 5	Math 1210	Math 1220
	3	Math 1050/ 1060	Math 1210
Calculus BC Test	4 or 5	Math 1210/ 1220	Math 2210
	3	Math 1210	Math 1220

Computer Science Minor

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 *at* the University of Utah):		
CS 1400 [1]	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 acheive a letter grade of C- or better in these courses.

[1] 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.

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 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 o f 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

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.

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

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.
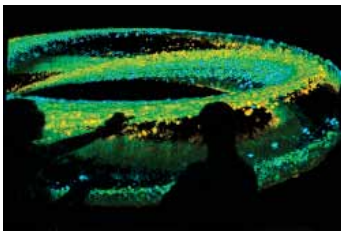
Research There are a number of ways to become involved in research as an undergraduate student. Students are encouraged to discuss research options and opportunities with College of Engineering faculty. There are two formal research avenues undergraduate students can investigate: The Merrill Engineering Scholars Fellowship and The Undergraduate Research Opportunities Program. Visit www.coe.utah.edu/current-undergrad/research 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. uofuiphone.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.

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.

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. Students may also participate in the University's honor program through Honors College. For more information, please visit: 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 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 completition of 60 credits will be required to meet with an advisor to declare a major or pre-major.

Academic Support

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

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.

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.

Computer Science Courses

The number and title of each course is followed by the number of semester hours it carries, the semester(s) during which it is taught (F=Fall, S=Spring, U=Summer), its prerequisites and co-requisites.

Where a course has both a 5000-and 6000-level number, the 5000-level version is intended for under-graduates, and the 6000-level version is for honors and graduate students. The two versions of the class will meet together, but extra work will be expected of honors and graduate students. Additional credit toward the bachelor's degree will not be given for taking a 6000-level course after taking the 5000-level version. Courses that have only 6000-level numbers may be taken by graduate and advanced undergraduate students.

Some elective classes are not offered every year. Check the online schedule or talk to the computer science academic advisor for more information. For a complete list of courses and course descriptions, visit the University of Utah online catalog at www.ugs.utah.edu/catalog.

| F=Fall, S=Spring, U=Summer | | * Co-Requisites | |

Courses	Credits	Semesters	Prerequisites
1000 Engineering Computing	3	F/S	*MATH 1210
1001 Engineering Computing using MATLAB	1.5	F/S	*MATH 1210
1020 Introduction to Programming in C++	3		
1040 Creating Interactive Web Content	3	F/S	
1050 Computers in Society	3		
1060 Explorations in Computer Science	3	F/S	
CS 1400 Introduction to Computer Science	3	F/S/U	
CS 1410 Intro. to Object-Oriented Programming	4	F/S	CS 1400, *MATH 1210
CS 1960 Freshmen Symposium	1	S	
2000 Introduction to Programming in C	4	F	*MATH 1210, CS 1010
2100 Discrete Structures	3	F	CS 1410 , MATH 1210
2420 Intro. to Algorithms & Data Structures	4	S/U	CS 1410
3010/3011 Industry Forum	1	S	Major status
3020 Research Forum	1	F	Major status
3100 Models of Computation	3	F	CS 2100
3130 Engineering Probability & Statistics	3	F	Math 1220
3200 Scientific Computation	3	S	CS 2420, MATH 1220
3500 Software Practice I	4	F	Major status
3505 Software Practice II	3	S	CS 3500
3650 3D Modeling for Video Games & Machinima	3	F	
3660 Interactive Machinima	3	S	

Computer Science Courses

Courses	Credits	Semesters	Prerequisites
3700 Fundamentals of Digital System Design	4	S	PHYS 2220
3710 Computer Design Laboratory	3	F	CS/ECE 3700, CS/ECE 3810
3810 Computer Organization	4	F	Major status
3960 Special Topics	1–4		
3991 Computer Engineering Junior Seminar	0.5	F	CE major status
3992 CE Pre-Thesis/Pre-Project	0.5	S	CS/ECE 3710, 3991,
4005 Honors Research Practice	3	F	CS 3500, CS Honors track
4010 CS Internship	1–3		CS 3505
4055 Advanced 3D Character Production	3	S	CS 3650
4060 Digital Figure Sculpting	3	S	
4150 Algorithms	3	S	CS 2100
4190 Programming Challenging	2	F	Instructor consent
4400 Computer Systems	4	F	CS 3810
4500 Software Engineering Laboratory	3	S	CS 3505, senior in CS
4510 EAE Senior Project I	3	F	CS 3505, senior n EAE
4515 EAE Senior Project II	3	S	Senior standing in EAE
4540 Web Software Architecture	3	S	CS 3500
4550 Simulation	3	S	CS 3505
4710 Computer Engineering Senior Projec	3	F	CS/ECE 3992, 5780
4950 Independent Study	1–4		
4960–4964 Special Topics	1–4		
4970 Computer Science Bachelors Thesis	3		Senior standing in CS
4991 CE Senior Thesis I	2	F	CS/ECE 3992 and approved senior thesis proposal
4992 Computer Engineering Senior Thesis II	2	S	CS/ECE 4991
4999 Computer Science Honors Thesis	3		University Honors Track
5010 Software Practice I	4	F	CS 2420 and permission
5020 Software Practice II	3	S	CS 5010 and permission
5040 Teaching Introductory Computer Science	1	F/S	Permission of instructor
5100 Foundations of Computer Science	3	S	CS 3100, CS 4150
5130 Computational Statistics	3	S	Major Status
5150 Advanced Algorithms	3	F	CS 4150
5160 Computational Geometry	3	S	CS 4150
5300 Artificial Intelligence	3	S	CS 3505, CS 3130, CS 4150
5310 Robotics	3	F	MATH 2270 or 2250, PHYS 2210
5320 Computer Vision	3	S	CS 3505, MATH 2270 or 2250
5340 Natural Language Processing	3	F	CS 3505
5350 Machine Learning	3	F	CS 3505
5460 Operating Systems	4	S	CS 4400

Computer Science Courses

Courses	Credits	Semesters	Prerequisites
5470 Compiler Principles and Techniques	4	S	CS 3100, CS 4400
5480 Computer Networks	3	S	CS 4150, CS 4400
5510 Programming Language Concepts	3	F	CS 3500
5530 Database Systems	3	S	CS 3500
5540 Human/Computer Interaction	3		CS 3500
5600 Introduction to Computer Graphics	3	S	CS 3500, MATH 2250 or 2270
5610 Interactive Computer Graphics	3	F	CS 5600
5630 Scientific Visualization	3	F	CS 3505; 3200, 6210 or MATH 5600
5650 Visual Perception for Graphics	3	S	
5710 Digital VLSI Design	4	F	CS 3700
5720 Analog Integrated Circuit Design	3	S	ECE 3110
5740 Computer-Aided Design of Digital Circuits	3	S	CS/ECE 3700, CS 4150
5745 Testing and Verification of Digital Circuits	3		ECE/CS 3700
5750 Synthesis,Verification of Asynchronous VLSI Systems	3		CS/ECE 3700, 3505
5780 Embedded System Design	4	S	CS/ECE 3810, CS 2000 or 4400
5785 Advanced Embedded Systems	3	F	CS/ECE 5780
5789 Embedded Systems & Kinetic Art	3		Major Status
5830 VLSI Architecture	3	odd years (S)	CS/ECE 3700, CS/ECE 3810
5950 Independent Study	1–4		
5955–5969 Special Topics	1–4		
6020 Conducting, Presenting Research	3		Grad standing in CS
6050 3D Modeling for VGA&M	3		Grad standing in CS
6055 Advanced 3D Character Production	3		CS 6050
6060 Digital Figure Sculpting	3		Grad standing in CS
6070 EAE:MGS Game Design I	3		Admission to EAE:MGS
6071 EAE:MGS Game Design II	4		CS 6070
6072 EAE:MGS Game Design III	3		CS 6071
6080 EAE:MGS Game Projects I	3		Admission to EAE:MGS
6081 EAE:MGS Game Projects II	4		CS 6080
6082 EAE:MGS Game Projects III	3		CS 6081
6090 EAE:MGS Game Engineering I	3		Admission to EAE:MGS
6091 EAE:MGS Game Engineering II	4		CS 6090
6092 EAE:MGS Game Engineering III	3		CS 6091
6100 Foundations of Computer Science	3	S	CS 3100, CS 4150
6110 Formal Methods for System Design	3	S	CS 5100/6100
6130 Computational Statistics	3		Grad standing in CS
6150 Advanced Algorithms	3		CS 4150

Computer Science Courses

Courses	Credits	Semesters	Prerequisites
6160 Computational Geometry	3	even years (S)	CS 4150
6210 Advanced Scientific Computing I	3	F	CS 3200, CS 3505, MATH 3150
6220 Advanced Scientific Computing II	3	S	CS 6210 or MATH 5600
6230 High Performance Parallel Computing	3	S	Programming in C/C++
6300 Artificial Intelligence	3	S	CS 3505
6310 Robotics	3	F	CS 1000, MATH 2250, PHYCS 2210
6320 Computer Vision	3	S	CS 3505, MATH 2210, MATH 2270
6340 Natural Language Processing	3	F	CS 3505
6350 Machine Learning	3	F	CS 2100, CS 2420
6360 Virtual Reality	3	odd years (S)	CS 5310/6310
6370 Geometric Computation	3	F	CS 1020, MATH 2250
6380 Multiagent Systems	3	S	See instructor
6460 Operating Systems	4	F	CS 4400
6470 Compiler Principles & Techniques	3	F	See instructor
6475 Advanced Topics in Compilation	3	F	CS 6470
6480 Computer Networks	3	F	CS 4150, CS 4400
6490 Network Security	3	S	CS 5480/6480
6510 Functional Programming	3	F	CS 3100, CS 5510
6530 Database Systems	3	F	CS 3500
6540 Human/Computer Interaction	3	F	CS 3500
6600 Math Foundations of Graphics	3		Grad standing
6610 Advanced Computer Graphics I	3	F	CS 5600
6620 Ray Tracing	3	S	CS 5610/6610
6630 Scientific Visualization	3	F	CS 3505; 3200, 6210 or MATH 5600
6640 Image Processing	3	S	CS 2420, MATH 2250
6650 Visual Perception for Graphics	3	S	
6670 Computer-Aided Geometric Design I	3	F	MATH 2210, 2250, CS 3505
6680 Computer-Aided Geometric Design II	3		CS 6670
6710 Digital VLSI Design	4		CS 3700
6712 Digital IC Projects Testing	1	S	CS/ECE 6710
6720 Advanced Integrated Circuit Design II	3	S	ECE 3110
6721 Analog Integrated Circuits Lab	1	S	CS 6720
6722 Analog Integrated Circuits Project Testing	1	F	CS/ECE 6720
6740 Computer-Aided Design of Digital Circuits	3	S	CS/ECE 3700, CS 4150
6745 Testing, Verification of Digital Circuits	3		
6750 Synthesis,Verification of Asynchronous VLSI Systems	3	F	CS3700, 3505
6760 Modeling, Analysis of Bio. Networks	3	F	See instructor
6770 Advanced Digital VLSI Systems Design	4	S	CS6710, instructor permission
6780 Embedded System Design	4	S	CS/ECE 3810, CS 2000 or 4400

Computer Science Courses

Courses	Credits	Semesters	Prerequisites
6785 Advanced Embedded Systems	3	F	CS/ECE 5780/6780
6810 Computer Architecture	3	F	CS/ECE 3810
6830 VLSI Architecture	3	odd years (S)	CS/ECE 3700, CS/ECE 3810
6945 Graduate Internship	0.5–3		
6955–6969 Special Topics	1–4		
7010 Writing Research Proposals	3	S	Graduate standing in CS
7120 Information-Based Complexity	3		CS 3200, MATH 2270, MATH 3210
7240 Sinc Methods	3	S	CS 6210 or MATH 5600 or MATH 5610
7250 Advanced Topics in Scientific Computing	3	F	CS 6220
7310 Advanced Manipulation and Locomotion	3		CS 6310 or ME 6220
7320 System Identification for Robotics	3	even years (S)	CS 5310/6310 or ME EN 5220/6220
7460 Distributed Operating Systems	3		CS 5460, CS 5480/6480
7520 Programming Language Semantics	3	S	CS 3100, CS 5510
7640 Image Processing	3		CS 2420, MATH 2250
7650 Realistic Image Synthesis	3	F	CS 6620, CS 6670, MATH 5010
7810 Advanced Computer Architecture	3	S	CS/ECE 6810
7820 Parallel Computer Architecture	3	S	CS/ECE 6810

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