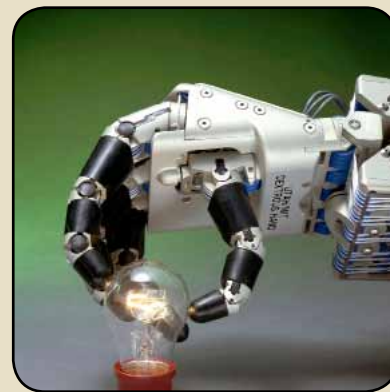
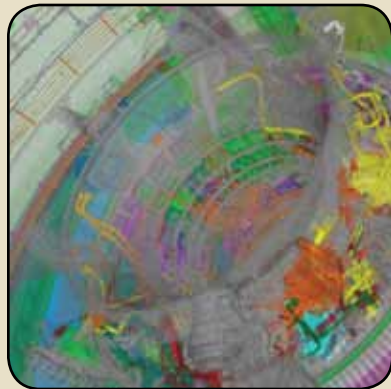


Computer Science

Undergraduate Student Handbook 2010-2011



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

Welcome to the School of Computing



“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 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.

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Administration

Leadership

Director, School of Computing



Martin Berzins
MEB 3190
Phone: 801-585-1545
mb@cs.utah.edu

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

Associate Director, School of Computing



Robert Kessler
MEB 3146
Phone: 801-581-4653
kessler@cs.utah.edu

Systems software and software engineering

Associate Director, School of Computing



Charles Hansen
WEB 4692
Phone: 801-581-3154
hansen@sci.utah.edu

Visualization, computer graphics, parallel computation, computer vision

Associate Director, School of Computing
Director, Robotics MS Track



John Hollerbach
MEB 2196A
Phone: 801-585-6978
jmh@cs.utah.edu

Robotics, teleoperation, virtual reality, and human motor control

Undergraduate Program

Director, Undergraduate Studies



Jim de St. Germain
MEB 3190
Phone: 801-585-3352
germain@cs.utah.edu

Artificial Intelligence, parallel computing, autonomous agents

Director, Educational Programs



Joe Zachary
MEB 3190
Phone: 801-581-7079
zachary@cs.utah.edu

Application of computers to education

Director, Combined BS/MS Program



Thomas Fletcher
WEB 4686
Phone: 801-587-9641
fletcher@sci.utah.edu

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

Undergraduate Advisor



Kelly Olson
MEB 3190
Phone: 801-581-8225
kelly@cs.utah.edu

Administration

Graduate Programs

Director, Graduate Studies



Suresh Venkatasubramanian
MEB 3442
Phone: 801-581-8233
suresh@cs.utah.edu

Algorithms, computational geometry and data mining

Director, Graduate Admissions



Ellen Riloff
MEB 3140
Phone: 801-581-7544
riloff@cs.utah.edu

Natural language processing, information retrieval, and artificial intelligence

Director, MSIT

Director, Data Management & Analysis Track



Juliana Freire
MEB 3404
Phone: 801-585-5047
juliana@cs.utah.edu

Databases, web systems

Director, Computer Engineering



Erik Brunvand
MEB 3142
Phone: 801-581-4345
elb@cs.utah.edu

Computer architecture and VLSI systems

Director, Graphics/ Visualization Track



Claudio Silva
WEB 4893
Phone: 801-587-7588
csilva@sci.utah.edu

Scientific visualization, computer graphics, computational geometry

Director, Scientific Computing Track

Director, Computational Engineering & Science



Mike Kirby
WEB 3602
Phone: 801-585-3421
kirby@sci.utah.edu

Scientific computing and visualization

Master's Advisor



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

Office Manager

Ph.D. Advisor



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

Faculty

Assistant Professor



Rajeev Balasubramonian
MEB 3414
Phone: 801-585-4553
rajeev@cs.utah.edu

Computer architecture: clustered processors, memory hierarchy bottlenecks

Assistant Professor



Adam Bargteil
MEB 3456
Phone: 801-585-0132
adamb@cs.utah.edu

Computer graphics and animation

Professor & Dean, College of Engineering



Richard Brown
WEB 1692
Phone: 801-585-7498
brown@utah.edu

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

Professor



Elaine Cohen
MEB 2891
Phone: 801-581-8235
cohen@cs.utah.edu

Computer graphics, scientific visualization, geometric modeling, mechanical design

Professor



Al Davis
MEB 3424
Phone: 801-581-3991
ald@cs.utah.edu

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

Research Associate Professor



Sam Drake
WEB 1650
Phone: 801-581-7933
drake@cs.utah.edu

Integrated process planning and computer aided manufacturing, design, industrial robotics

Industrial Liaison



Matthew Flatt
MEB 3122
Phone: 801-587-9091
mflatt@cs.utah.edu

Programming languages and systems

Professor



Guido Gerig
WEB 3686
Phone: 801-585-0327
gerig@sci.utah.edu

Medical image analysis

Faculty

Professor



Ganesh Gopalakrishnan
MEB 3428
Phone: 801-581-3568
ganesh@cs.utah.edu

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

Associate Professor



Mary Hall
MEB 3466
Phone: 801-585-1039
mhall@cs.utah.edu

Optimization, parallel-
ization and compilers

Professor



Tom Henderson
WEB 2871
Phone: 801-581-3601
tch@cs.utah.edu

Computer vision, mobile
robotics

Professor



Lee Hollaar
MEB 4154
Phone: 801-581-8224
hollaar@cs.utah.edu

Digital intellectual
property law

Assistant Professor, Clinical



Peter Jensen
MEB 3148
Phone: 801-585-9418
pajensen@cs.utah.edu

Distinguished Professor



Chris Johnson
WEB 3850
Phone: 801-581-7705
crj@sci.utah.edu

Scientific computing, visual-
ization, imaging, and prob-
lem solving environments

Assistant Professor



Sneha Kasera
MEB 3408
Phone: 801-581-4541
kasera@cs.utah.edu

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

Assistant Professor



Matthew Might
MEB 3450
Phone: 801-581-8224
might@cs.utah.edu

Security, parallelism, verifi-
cation and optimization

Faculty

Assistant Professor, Clinical



Erin Parker
MEB 3190J
Phone: 801-587-9505
parker@cs.utah.edu

Programming languages,
Computer memory systems
and performance

Associate Professor



Valerio Pascucci
WEB 4646
Phone: 801-587-9885
pascucci@sci.utah.edu

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

Research Assistant Professor



Marcel Prastawa
WEB 4666
Phone: 801-581-8984
prastawa@cs.utah.edu

Image analysis, computer
vision and machine learning
(pattern recognition)

Assistant Professor



John Regehr
MEB 3470
Phone: 801-581-4280
regehr@cs.utah.edu

Embedded, real-time & operat-
ing systems, sensor networks,
static analysis

Professor



Rich Riesenfeld
WEB 2897
Phone: 801-581-5843
rfr@cs.utah.edu

Computer graphics, geometric
modeling, design

Professor



Kris Sikorski
MEB 3418
Phone: 801-581-8579
sikorski@cs.utah.edu

Parallel scientific computa-
tion and computational
complexity

Professor



William Thompson
MEB 3446
Phone: 801-585-3302
thompson@cs.utah.edu

Computer vision, visual
perception

Associate Professor



Ross Whitaker
WEB 3464
Phone: 801-587-9549
whitaker@cs.utah.edu

Computer vision, visualiza-
tion, and image processing

Office Staff

Budget/Planning Analyst



Alina Kalm
MEB 3190
Phone: 801-581-8224
alina@cs.utah.edu

Development & Outreach



Chris Coleman
MEB 3190
Phone: 801-581-8580
coleman@cs.utah.edu

Accountant



Callie Martens
MEB 3190
Phone: 587-3652
callie@cs.utah.edu

Accountant



Chethika Wijayawardhana
MEB 3190
Phone: 801-587-9266
chethika@cs.utah.edu

Front Desk



Vickie Jackson
MEB 3190
Phone: 801-581-8224
vickie@cs.utah.edu

Front Desk



Emily Roper
MEB 3190
Phone: 801-581-8224
emily@cs.utah.edu

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.

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.

Undergraduate Degrees

Bachelor's of Science in Computer Science
Bachelor's of Science in Computer Engineering

Combined Degrees

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
- Information Technology
- Graphics and Visualization
- Robotics
- Data Management and Analysis

Ph.D. in Computer Science
Ph.D. in Computing

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

School of Computing Degrees

BACHELOR OF SCIENCE DEGREE

The standard Bachelor of Science in computer science track is a software-oriented degree which includes 19 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 six beginning 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. DEGREE

The combined Bachelor of Science/ Master of Science degree 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 start to take 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.

- 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) and a 2.8 GPA in order to be admitted to full major status. Students should also hold a 2.8 cumulative GPA in all classes.

PRE-MAJOR REQUIREMENTS

All six courses are required in order to obtain full major status. You must earn a C- or better in each course, and a 2.8 average GPA among the following courses:

CS 1010 ¹	Intro to Unix	0.5 credits
CS 1400 ²	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 1010 must be passed with a CR grade. This is a credit/ no credit, Internet-based course.

² 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 first complete the courses required of pre-majors 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. One may not pre-register for any upper division classes in computer science without first being admitted as a full major or a minor.

Applications for admission are reviewed at the end of spring and summer semesters. New majors are only allowed into the major during fall semesters. 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.

SECOND DEGREE AND DOUBLE MAJORS

Some students may wish to earn a degree in computer science as their second Bachelor of Science degree. This is possible as long as the requirements for both degrees are met. In some cases, fewer additional class hours are needed because of overlaps in the two degrees. This is especially true of students whose other degree is in computer engineering, electrical engineering, or mathematics, where upper level classes may serve as computer science or math electives. General education and bachelor degree requirements for the University 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.



Some students may wish to earn a degree in computer science as their second Bachelor of Science degree. This is possible as long as the requirements for both degrees are met. In some cases, fewer additional class hours are needed because of overlaps in the two degrees. This is especially true of students whose other degree is in computer engineering, electrical engineering, or mathematics, where upper level classes may serve as computer science or math electives. General education and bachelor degree requirements for the University 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 19 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.

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 University writing requirement is satisfied by either Wrtg 2010 or ESL 1060 (for students who speak English as a second language).
- b. The quantitative reasoning requirement is satisfied by Math 1210 or 1250 which is required for computer science pre-majors.
- c. The two-course requirement in physical and life sciences is satisfied by classes required for the major.
- d. Students must take two intellectual explorations courses in each of fine arts, humanities, and social sciences . Two of these six courses must be upper division. One should meet the University diversity requirement, and one should meet the University international 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 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 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, which are required for CS majors.
- c. The diversity requirement can be satisfied by taking a course from an approved list as part of the intellectual explorations courses.
- d. The international 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.

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. A grade of C- or better must be earned in each of these courses, and may not be taken for CR/NC.

Required courses:

Math 1210	Calculus I	4 credits
Math 1220	Calculus II	4 credits
Physics 2210	Physics for Scientists and Engineers I	4 credits
Two required math electives must be selected from the following three options:		
Math 2210	Calculus III	3 credits
Math 2270 ¹	Linear Algebra	4 credits
ECE 3530 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. ²		
Physics 2220	Physics for Scientists and Engineers II	4 credits

¹ Note that Math 2250 covers the same material as Math 2270 and 2280, although in less depth. Hence, if 2270 is used as one of the required math/science electives, Math 2250 may not be counted as an elective.

² 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 1010	Intro to Unix	0.5 credits
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).		
<ul style="list-style-type: none"> • Seminars may not be counted. • Only (1) independent study and (1) internship may be counted with permission. • Any combination of Industry Forum, Research Forum, TA Training, or Programming Challenges can be combined to fulfill one of these requirements (up to three credits). • Only two specialty EAE courses (such as, but not limited to: Machinima, 3D Modeling, Advanced 3D Modeling, or Character Animation) may be counted toward the required seven CS electives for graduation. • CS 3130 may not be used as a CS elective. It will count as a math/science elective. 		
Capstone requirement. One of the following must be completed:		
CS 4500	Software Engineering Lab	3 credits
CS 4970	Bachelor's Thesis	3 credits

Degree Requirements

COMPUTER SCIENCE B.S. DEGREE REQUIREMENTS: 2010-11

Pre-Major Requirements:

Required in order to apply for full major status: C- or better in each course, and a 2.8 average GPA among the following:

1. CS 1010, Intro. to Unix (.5)
2. CS 1400, Intro. to Computer Science (3)
3. CS 1410, Object-Oriented Program (4)
4. CS 2420, Data Structures/Algorithms (4)
5. Math 1210, Calculus I (4)
6. Math 1220, Calculus II (4)

General Education Requirements:

1. Wrtg 2010, Intermediate Writing
2. Wrtg 3012 or 3014 or 3015
3. American Institutions [AI]

*Choose one: Econ 1740, Hist 1700, PolS 1100, Hon 2212

A total of six courses must be taken in the following three areas (with two from each): Fine Arts, Humanities, Behavioral/Social Science. TWO of those six must be upper division (3000+), one must satisfy the Diversity requirement and one must satisfy the International requirement.

4. Fine Arts [FF]
5. Fine Arts [FF]
6. Humanities [HF]
7. Humanities [HF]
8. Social/ Behavioral Science [BF]
9. Social/ Behavioral Science [BF]

*Upper Division 1

*Upper Division 2

*Diversity [DV]

*International [IR]

Math/Science Electives:

Physics 2210 is required, plus two of the three required electives: Math 2210, Math 2270, or ECE 3530/ CS 3130. Two additional electives are required; each must be at least 3 credits. Choose any non-CS class that has Math 1220 (Calculus II) as a prerequisite or co-requisite. Math 2200 will not be accepted. Math 2250 will not be allowed if Math 2270 is taken. We will also accept Physics 2220, ECE 1270, Biol 1210, or Chem 1210.

1. Physics 2210, Physics for Sci. & Eng. I
2. Required Elective 1 _____
3. Required Elective 2 _____
4. _____
5. _____

Major Requirements:

The following requirements are restricted to FULL majors:

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

Theory Restricted Elective:

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

1. CS 3100, Models of Computation (3)
2. CS 3200, Scientific Computing (3)

Computer Science Electives:

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

Seminars may not be counted. Only one Independent Study class and one Internship class (at least 3 credits each) can count as an elective. Any combination of Industry Forum, Research Forum, TA Training, or Programming Challenges can be combined to fulfill one of these required courses.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____

Capstone Requirement:

Choose ONE:

(Permission required from Undergraduate Director for thesis option. Senior project may only be taken during the final semester, or no more than one semester prior to graduating.)

1. CS 4500, Software Engineering Lab (3)
2. CS 4970, Bachelor's Thesis (3)

CS Suggested Course Outline

EXAMPLE COMPUTER SCIENCE DEGREE FOUR-YEAR PROGRAM OF STUDY

The CS degree can be completed in four years if the student completes the pre-major sequence during the freshman year. If a student must take preparatory classes first, or is unable to attend school full time, more than four years may be required. Please see the CS advisor for an alternative suggested course outline.

	Fall Semester	Spring Semester
Freshman (29.5 credits)	CS1010 Unix .5 CS 1400 or CS1410 3/4 Math1210 Calc I 4 Wrtg2010 Writing 3 General Education course ¹ 3 (14.5)	CS1410 or CS2420 4 Math1220 Calc II 4 Phys2210 Physics I 4 General Education course ¹ 3 (15)
Summer	* CS 2420 may be required during summer semester	
Sophomore (29 credits)	CS2100 Discrete 3 CS3500 Software Prac. I 4 CS3810 Comp. Org. 4 Wrtg3012, 3014 or 3015 3 (14)	CS3505 Software Prac. II 3 CS elective 3 Math required elective 1 3 American Institutions course 3 General Education course 3 (15)
Junior (32 credits)	CS4400 Comp. Systems 4 CS3100 ² Theory elective 3 Math required elective 2 3 General Education course 3 General Education course 3 (16)	CS4150 Algorithms 3 CS elective 3 CS elective 3 Math/ Science elective 4 General Education course 3 (16)
Senior (32 credits)	CS elective 3 CS elective 3 CS elective 3 International requirement 3 Free elective (if needed) 4 (16)	CS4500 Capstone 3 CS elective 3 Math/ Science elective 4 3000-level Diversity course 3 Free elective (if needed) 3 (16)
(122.5 total credits)		

¹ Students should consider taking E-LEAP during their freshman year to fulfill some general education requirements. See page 34 for more information on E-LEAP.

² If both CS 3100 and CS 3200 are taken, the second will be counted as a CS elective. CS 3200 is offered in the spring. If selected, a CS elective should be taken in place of CS 3100.

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:
Writing requirement — FA 3600 (Writing for New Media) replaces the upper division writing requirement.

Entertainment Arts and Engineering Program

EAE MATH, SCIENCE AND ENGINEERING REQUIREMENTS		
Seven classes in math, science, and/or engineering are required. The following are required courses. A grade of C- or better must be earned in each of these courses, and may not be taken for CR/NC:		
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
Physics 2220	Physics for Scientists and Engineers II	4 credits
One required math elective must be selected from the following two options: <i>Note that both courses will be required for the 2011-12 EAE requirements, replacing the final open elective below. It is suggested that current majors (2010 catalog or prior) take both.</i>		
Math 2270 ¹	Linear Algebra	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: <i>The 2011-12 EAE requirements will replace this requirement with the above requirements.</i>		
Any non-CS class from the Colleges of Engineering, Mines, or Science that requires Calculus II as a prerequisite or corequisite ²		
Biol 1210	Principles of Biology	4 credits
Chem 1210	General Chemistry I	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 math/science elective, Math 2250 may not be counted.

² Math 2200 will not be accepted.

Entertainment Arts and Engineering Program

COMPUTER SCIENCE EAE MAJOR REQUIREMENTS

A minimum of 19 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 1010	Intro to Unix	0.5 credits
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 I I	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 5460	Operating Systems	4 credits
CS 5530	Databases	3 credits
CS 5300	Artificial Intelligence	3 credits
Theory restricted elective. Students must take the following course:		
CS 3200	Scientific Computing	3 credits

Entertainment Arts and Engineering Program

EAE requirement. The following class is required:		
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 electives (not required). These 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
FILM 2700 ¹	Survey of Videogame Theory	3 credits

EAE computer science elective. One of the following classes must be taken:		
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 FILM 2270 will be required starting Fall 2011 for CS EAE majors. It is suggested that current majors (2010 catalog or prior) take this course.

EAE Degree Requirements

COMPUTER SCIENCE B.S. DEGREE REQUIREMENTS, EAE PROGRAM: 2010-11

Pre-Major Requirements:

Required in order to apply for full major status: C- or better in each course, and a 2.8 average GPA among the following:

1. CS 1010, Intro. to Unix (.5)
2. CS 1400, Intro. to Computer Science (3)
3. CS 1410, Object-Oriented Program (4)
4. CS 2420, Data Structures/Algorithms (4)
4. Math 1210, Calculus I (4)
5. Math 1220, Calculus II (4)

General Education Requirements:

1. Wrtg 2010, Intermediate Writing
2. FA 3600, Writing for New Media
3. American Institutions [AI]

*Choose one: Econ 1740, Hist 1700, Pols 1100, Hon 2212

A total of six courses must be taken in the following three areas (with two from each): Fine Arts, Humanities, Behavioral/Social Science. TWO of those six must be upper division (3000+), one must satisfy the University Diversity requirement and one must satisfy the University International requirement.

4. Art 1020, Drawing for Non-Majors [FF]
5. Fine Arts [FF]
6. Humanities [HF]
7. Humanities [HF]
8. Social/ Behavioral Science [BF]
9. Social/ Behavioral Science [BF]

- *Upper Division 1
- *Upper Division 2
- *Diversity [DV]
- *International [IR]

Math/Science Electives:

Physics 2210, 2220, and Math 2210 are required, plus one of the two required electives: Math 2270 or ECE 3530/ CS 3130. One additional elective is required (at least 3 credits). Choose any non-CS class that has Math 1220 (Calculus II) as a prerequisite or co-requisite. Math 2200 is not allowed. Math 2250 will not be accepted if Math 2270 is taken. We will also accept ECE 1270, Biol 1210, or Chem 1210.

1. Physics 2210, Physics for Sci. & Eng. I
2. Physics 2220, Physics for Sci. & Eng. II
3. Math 2210, Calculus III
4. Required Elective 1 _____
5. _____

Major Requirements:

The following requirements are restricted to FULL majors:

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

Theory Restricted Elective:

1. CS 3200, Scientific Computing (3)

Film Requirement:

1. FILM 3500, Film Production (4)

EAE CS Requirements:

1. CS 3650, 3D Modeling for VG&M (3)
2. CS 3660, Machinima (3)
3. CS 5460, Operating Systems (4)
4. CS 5300, Artificial Intelligence (3)
5. CS 5530, Databases (3)

EAE CS Elective:

Choose one course, 3000-level+ from approved list (pg 21)

1. _____

Series Requirement:

Choose one

1. FILM 2610, Computer Animation I (4)
2. FILM 2620, Computer Animation II (4)

OR

1. FILM 3710, Game Design I (4)
2. FILM 3720, Game Design II (4)

Capstone Requirement:

1. CS 4510, Senior Project I (3)
2. CS 4515, Senior Project II (3)

EAE Suggested Course Outline

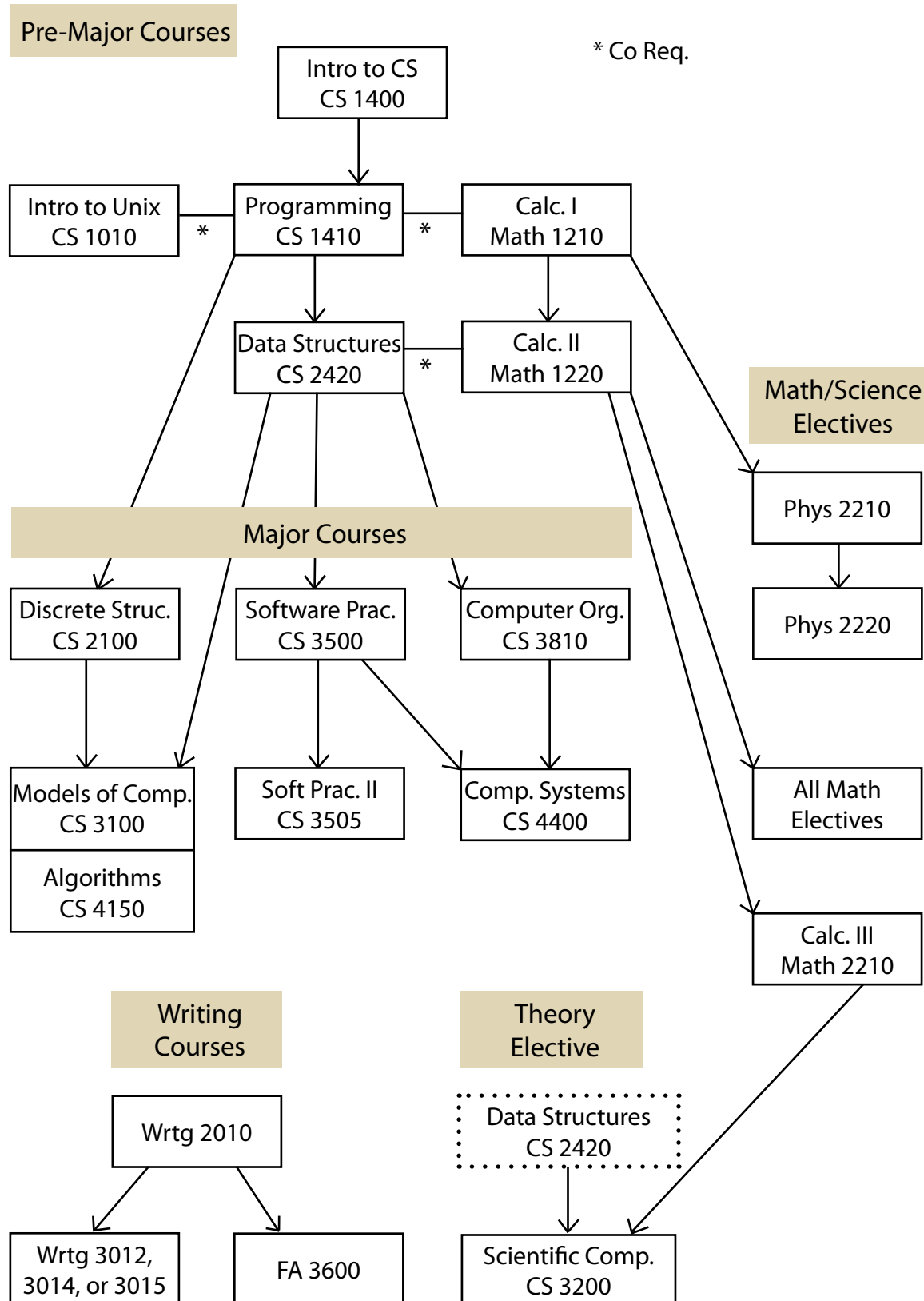
EXAMPLE COMPUTER SCIENCE EAE DEGREE FOUR-YEAR PROGRAM OF STUDY

The computer science degree can be completed in four full-time years of study if the student is capable of completing the computer science and calculus pre-major sequences during the freshman year. If a student must instead take preparatory classes as a freshman, more than four years may be required to earn a degree.

This table gives an eight-semester example program leading to computer science B.S. with an emphasis in Engineering Arts and Entertainment. It is meant only as a guide, since the scheduling of electives and general education classes depends upon which ones are selected. All requirements for a general degree in computer science must be met. It is possible to take general education requirements during summer sessions to ease the load.

	Fall Semester	Spring Semester
Freshman (31.5 credits)	CS1010 Unix .5 CS 1400 or CS1410 3/4 Math1210 Calc I 4 Art1020 Basic Drawing 3 General Education course 3 <u>(14.5)</u>	CS1410 or CS2420 4 Math1220 Calc II 4 Wrtg2010 Writing 3 American Institutions course 3 General Education course 3 <u>(17)</u>
Summer	* CS 2420 may be required during summer semester	
Sophomore (30 credits)	CS3500 Software Prac. I 4 CS3650 3D Modeling 3 CS3810 Comp. Org. 4 FILM3500 Film Production 4 <u>(15)</u>	CS3505 Software Prac. II 3 CS3660 Machinima 3 FA3600 Wrtg New Media 3 Math2210 Calculus III 3 Gen Ed/Bachelor Degree Req. 3 <u>(15)</u>
Junior (32 credits)	CS2100 Discrete 3 CS4400 Comp. Systems 4 Phys2210 Physics I 4 EAE Series: Animation/Game I 4 <u>(15)</u>	CS3200 Scientific Comp. 3 CS4150 Algorithms 3 CS5300 A.I. 3 Phys2220 Physics II 4 EAE Series: Animation/Game II 4 <u>(17)</u>
Senior (29 credits)	CS4510 Senior Project I 3 CS5460 Operating Syst. 4 Math required elective I 3 Gen Ed/Bachelor Degree Req. 3 General Education course 3 <u>(16)</u>	CS4515 Senior Project II 3 CS5530 Databases 3 EAE CS elective 3 Math/ Science elective 4 <u>(13)</u>
	(122.5 total credits)	

Prerequisite Course Requirements



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 2.3 or higher, and also maintain a grade point average (GPA) of 2.3 in computer science classes. Students whose GPA in either of these categories falls below 2.3 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.

Advanced Placement

ADVANCED PLACEMENT EXAM CREDIT

The scores on the following page are necessary for the School of Computing to waive a 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. Students should submit a “request for evaluation” to the Admissions Office to have their AP credits officially recorded toward University graduation requirements.

Credit for Advanced Placement tests is given through the University and counts toward the total hours needed to graduate. Specific courses in the Computer Science major are waived based on high AP exam scores, independent of these credit hours. The grades listed on the following page are only for the purpose of determining the pre-major GPA which is used to determine acceptance into the computer science major, and are not part of a student’s University GPA. For example, a student who receives a 5 on the CS AB test and a 5 on the Calculus BC test would have CS 1410, CS 2420, Math 1210, and Math 1220 waived, with a pre-major GPA of 3.5 (4.0 + 4.0 + 3.3 + 2.7 divided by 4 classes) and would be allowed directly into the major as a freshman.

The following graph shows some of the general education courses that are cleared by AP scores. For a more detailed list and information about accepted AP credits and required scores, please visit: www.sa.utah.edu/admiss/AP.html.

ADVANCED PLACEMENT EXAM COURSE EQUIVALENTS FOR THE UNIVERSITY OF UTAH

AP Exam	General Education Course Waived	University Required Score	Semester Hours Awarded
American History	American Institutions	3	6
English	Wrtg 2010	4	6
European History	1 Humanities IE	3	6
Psychology	1 Social Science IE	3	3
World History	1 Humanities IE	3	6

Advanced Placement

ADVANCED PLACEMENT EXAM COURSE EQUIVALENTS FOR COMPUTER SCIENCE

AP Exam	U. Course Waived	Required Score	Equivalent Grade*
Biology	Biol 1210	4 or 5	
Chemistry	Chem 1210	4 or 5	
Computer Science A	CS 1400/ 1410	5	A / A
		4	B / **
Computer Science AB	CS 1400/ 1410/ 2420	5	A / A / A
		4	A- / B+ / B-
		3	B / B- / **
Physics C: Mech	Phys 2210	4 or 5	
Physics C: E&M	Phys 2220	4 or 5	
Calculus AB	Math 1210	5	A
		4	B-
	Math 1050/ 1060	3	
Calculus BC	Math 1210/ 1220	5	A / A
		4	B+ / B-
		3	B- / **
	Math 1050/ 1060	2	

** Course not waived and must be taken at the University of Utah.

*Grades are only used for major application, and do not factor into your University of Utah GPA.

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 18.5 semester hours of required computer science classes (plus Calculus I). The following classes must be taken:		
CS 1010	Intro to Unix	0.5 credits
CS 1410 ¹	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. 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. One may not pre-register for any upper division classes in computer science without first being admitted as a minor. Applications for admission are reviewed at the end of spring and summer semesters.

Students are admitted to the minor if their average grade in Math 1210, CS 1410, and CS 2420 is 2.8 or higher. They must also achieve a letter grade of C- or better in these courses. CS minors should submit an application to the minor to the academic advisor in MEB 3190.

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

* CS minors must contact the CS advisor in order to register for 3000-level CS courses.

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 or from the School of Computing office. They must be submitted to the School's office by March 1 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.

College of Engineering Scholarships: The College of Engineering also awards several scholarships (Kennecott, Ariel Berrier, Simon Ramo, and others) to the top students in the college. Students may also apply for financial aid from the College, which each year awards a number of Josephine Beam Educational Scholarships. These are worth approximately \$500 and are based on need. Information and applications are available on the web at www.coe.utah.edu/current-undergrad/scholarships, or from the Office of the Dean of Engineering (WEB 1650).

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

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. This one-credit course 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. CS students have received internships with notable companies such as IBM, Hewlett Packard, L-3 Communications Systems, Intel, and Micron. 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.

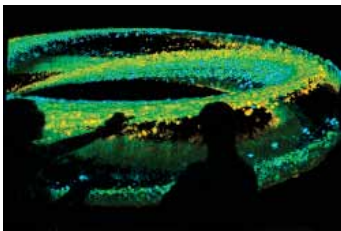
Student Involvement

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, please visit www.uucsc.com.

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 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. The School of Computing receptionist (MEB 3190, 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
Phone: 801-581-7631
annc@cs.utah.edu

Ph.D. Advisor

Karen Feinauer
MEB 3190
Phone: 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 (pre-major is sufficient).

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. 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. After you have created a plan, your CS advisor is available to discuss your plan with you, and/or enroll you into Graduation Guarantee.

GRADUATION GUARANTEE

(GG)

Graduation Guarantee (GG) is designed to help students create a long-term plan for their education, as well as a time frame for the completion of that plan. Students who choose to participate in this program will meet each semester with their academic advisor to ensure they are on schedule with their individualized graduation plans, as well as seek advice from Career Services regarding their future goals. To participate in Graduation Guarantee, a student must use the GPS tool to develop a plan, meet with the CS advisor, and read and agree to the University and Department Graduation Guarantee Guidelines. For more information on Graduation Guarantee, visit graduationguarantee.utah.edu. See the School of Computing departmental guidelines on page 37.

Academic Support

GRADUATION GUARANTEE DEPARTMENTAL GUIDELINES

Graduation Guarantee (GG) is available to computer science full major students, only after they have been accepted and declared as a computer science major.

Guidelines for Student Participation in Graduation Guarantee:

- 1) Complete the pre-major requirements, apply and be accepted into the CS major.
- 2) Read the CS Undergraduate Student Handbook and Institutional GG Guidelines.
- 3) Review your DARS report and design a plan in GPS. Your advisor will not set up the plan for you, but is available to help and make suggestions. You should review the Computer Science Roadmap in GPS for a suggested outline.
- 4) Meet with the CS advisor to approve your plan, and sign up for Grad Guarantee.
- 5) Meet with the CS advisor each semester before your scheduled registration time for the following semester.
- 6) Register for courses within 48 hours of your scheduled registration time.
- 7) Follow the plan designed for successful completion of your program. A GG plan allows a maximum of 5.5 years of enrollment at the U. Enrollment begins with the first course taken at the University.
- 8) Notify your advisor of any changes to your plan (including failed or withdrawn courses, or plans to take an outlined course later), or expected leave of absence.
- 9) Maintain a 2.3 cumulative GPA and a 2.3 GPA in your computer science courses.
- 10) Successfully complete each major requirement with a C- grade or higher.
- 11) Adhere to standards and policies outlined in the CS Undergraduate Handbook.

Graduation Guarantee Agreement will be voided for the following reasons:

- 1) Taking classes outside of your specific academic plan.
- 2) Failure to notify advisor of a leave of absence.
- 3) Failure to pass a major course with a C- grade or higher.
- 4) Failure to maintain a 2.3 cumulative grade point average, or CS grade point average.

You may revise your plan with your academic advisor **only twice** without penalty.

These departmental guidelines supplement the U of U institutional guidelines. It is the responsibility of the student to ask the department advisor for clarification. This document and enrollment in Graduation Guarantee, in no way enters the student or the School of Computing into a legal, binding contract. It is designed to assist the student in completing his or her program in a timely manner – which is a maximum of 5.5 years total enrollment at the University of Utah. This agreement only guarantees computer science (CS) courses offered through the School of Computing at the University of Utah, and does not guarantee courses in other departments. We guarantee that the courses you need (as outlined in your plan) will be offered or substituted so you may successfully complete the program in a timely manner. Days, times, and sections for CS courses are subject to change.

Academic Support

EMPLOYMENT OPPORTUNITIES

The School of Computing employs a number of junior and senior students as computer operators and as teaching assistants. These jobs involve 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 Web . In addition, general inquiries are received periodically from local industry and from University research groups for students who are interested in working part or full time. These are emailed to all computer science and computer engineering majors. More information may be obtained from the faculty advisor.



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 (www.careers.utah.edu). 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 undergraduates, 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

<u>Courses</u>	<u>Credits</u>	<u>Semesters</u>	<u>Prerequisites</u>
1000 Engineering Computing	3	F/S	*CS 1010, MATH 1210
1001 Engineering Computing using MATLAB	1.5	F/S	*CS 1010, MATH 1210
1010 Introduction to Unix	0.5	F/S/U	
1020 Introduction to Programming in C++	3		
1021 Introduction to Programming in Java	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	
CS 1410 Intro. to Object-Oriented Programming	4	F/S	CS 1400, *MATH 1210
CS 1960 Freshmen Symposium	1	S	
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2000 Introduction to Programming in C	4	F	*MATH 1210, CS 1010
2100 Discrete Structures	3	F	CS 1410
2420 Intro. to Algorithms & Data Structures	4	S/U	CS 1410
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3010/3011 Industry Forum	1	F/S	
3100 Models of Computation	3	F	CS 2420, CS 2100
3130 Engineering Probability & Statistic	3	F	Math 1220
3200 Scientific Computation	3	S	CS 2420, MATH 2210
3500 Software Practice I	4	F	CS 2420
3505 Software Practice II	3	S	CS 3500
3650 3D Modeling for Video Games & Machinima	3	F	

Computer Science Courses

<u>Courses</u>	<u>Credits</u>	<u>Semesters</u>	<u>Prerequisites</u>
3660 Interactive Machinima	3	S	
3700 Fundamentals of Digital System Design	4	S	CS 1410, PHYS 2220
3710 Computer Design Laboratory	3	F	CS/ECE 3700, CS/ECE 3810
3810 Computer Organization	4	F	CS 2420 or CS 2000
3950 Independent Study	1–4		
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, CE major status
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4005 Honors Research Practice	3	F	CS 3500, CS Honors track
4150 Algorithms	3	S	CS 2100, CS 3500
4400 Computer Systems	4	F	CS 3500, CS 3810
4500 Software Engineering Laboratory	3	S	CS 3505, senior in CS
4510 EAE Senior Project I	3	F	Senior standing in EAE
4515 EAE Senior Project II	3	S	Senior standing in EAE
4540 Web Software Architecture	3	S	CS 3505
4550 Simulation	3	S	CS 3505
4710 Computer Engineering Senior Project	3	F	CS/ECE 3710, 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
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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
5060 Legal Protection of Digital Information	2		
5100 Foundations of Computer Science	3	S	CS 3100, CS 4150
5150 Advanced Algorithms	3	F	CS 4150, CS 3130, Math 1220
5300 Artificial Intelligence	3	S	CS 3505
5310 Robotics	3	F	CS 1000, MATH 2250, PHYS 2210
5320 Computer Vision	3	S	CS 3505, MATH 2210, MATH 2270
5340 Natural Language Processing	3	F	CS 3505
5350 Machine Learning	3	F	CS 3505
5460 Operating Systems	4	F	CS 4400
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

Computer Science Courses

<u>Courses</u>	<u>Credits</u>	<u>Semesters</u>	<u>Prerequisites</u>
5520 Anatomy of a Modern Programming	3	S	CS 5510
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
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
5830 VLSI Architecture 3700, CS/ECE 3810	3	odd years (S)	CS/ECE
5950 Independent Study	1–4		
5960–5969 Special Topics	1–4		
6020 Conducting, Presenting Research	3		Grad standing in CS
6100 Foundations of Computer Science	3	S	CS 3100, CS 4150
6110 Formal Methods for System Design	3	S	CS 5100/6100
6150 Advanced Algorithms	3		CS 4150
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 Advanced Topics in Compilation	3	F	CS 5470
6480 Computer Networks	3	F	CS 4150, CS 4400
6490 Network Security	3	S	CS 5480/6480

Computer Science Courses

<u>Courses</u>	<u>Credits</u>	<u>Semesters</u>	<u>Prerequisites</u>
6510 Functional Programming	3	F	CS 3100, CS 5510
6530 Database Systems	3	F	CS 3500
6540 Human/Computer Interaction	3	F	CS 3500
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
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
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
6960–6969 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



SCHOOL OF COMPUTING

THE UNIVERSITY OF UTAH

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