UNIVERSITY OF WASHINGTON

OFFICE OF THE PRESIDENT

November 10, 2009

Dean Matthew O'Donnell
College of Engineering
Box 352180

Dear Matt:

Based on the recommendation of its Subcommittee on Admissions and Programs, the Faculty Council on Academic Standards has recommended approval of the revised admission and program requirements for the Bachelor of Science in Computer Engineering degree. A copy of the changes is attached.

I am writing to inform you that the College of Engineering is authorized to specify these requirements beginning spring quarter 2010.

The new requirements should be incorporated in printed statements and in individual department websites as soon as possible. The *General Catalog* website will be updated accordingly by the Registrar's Office.

Sincerely yours,

Mark A. Emmert
President

Enclosure

cc: Mr. Pim Lustig (with enclosure)
Mr. Robert Corbett (with enclosure)
Dr. Deborah H. Wiegand (with enclosure)
Mr. Todd Mildon, J.D. (with enclosure CSE-20091015A)

301 Gerberding Hall • Box 351230 • Seattle, Washington 98195-1230 • 206-543-5010 • FAX: 206-616-1784

UNIVERSITY OF WASHINGTON

CREATING AND CHANGING UNDERGRADUATE ACADEMIC PROGRAMS

OCT - 2 2009

OFFICE USE ONLY

Control #

CSE - 20091015A

After college/school/campus review, send a signed original and 8 copies to the Curriculum Office/ECAS, Box 355850.

For information about when and how to use this form: http://depts.washington.edu/uwcr/1503instructions.pdf

College/Campus Engineering	**Department/Unit** Computer Science & Engineering	**Date** 10/15/2009

New Programs

- ☐ Leading to a Bachelor of _____ in _____ degree.
- ☐ Leading to a Bachelor of _____degree with a major in _____.
- ☐ Leading to a _____ Option within the existing major in _____.
- ☐ Leading to a minor in _____

Changes to Existing Programs

- ☐ New Admission Requirements for the Major in _____ within the Bachelor of _____.
- ☒ Revised Admission Requirements for the Major in __Y__ within the Bachelor of __U__.
- ☒ Revised Program Requirements for the Major in Computer Engineering within the Bachelor of Science.
- ☐ Revised Requirements for the Option in _____within the major in _____.
- ☐ Revised Requirements for the Minor in _____.

Other Changes

- ☐ Change name of program from _____ to _____.
- ☐ New or Revised Continuation Policy for _____.
- ☐ Eliminate program in _____.

Proposed Effective Date: **Quarter:** ☐ Autumn ☐ Winter ☒ Spring ☐ Summer **Year: 20 10**

Contact Person: Dan Grossman	Phone: 6-1124	Email: djg@cs.washington.edu	Box: 352350

EXPLANATION OF AND RATIONALE FOR PROPOSED CHANGE

For new program, please include any relevant supporting documentation such as student learning outcomes, projected enrollments, letters of support and departmental handouts. (*Use additional pages if necessary*).

See attached document "Justification of Change to Computer Engineering Program".

OTHER DEPARTMENTS AFFECTED

List all departments/units/ or co-accredited programs affected by your new program or changes to your existing program and acquire the signature of the chair/director of each department/unit listed. Attach additional page(s) if necessary. *See online instructions.

Department/Unit:	Chair/Program Director:	Date:
Electrical Engineering	[signature]	Oct 16, 2009
Department/Unit: Statistics	Chair/Program Director: M. Hardwick	Date: 10/16/09

CATALOG COPY

Catalog Copy as currently written. Include only sections/paragraphs that would be changed if your request is approved. Please cross out or otherwise highlight any deletions.

See attached document "Current Catalog Copy".

PROPOSED CATALOG COPY

Reflecting requested changes (Include exact wording as you wish it to be shown in the printed catalog. Please underline or otherwise highlight any additions. If needed, attach a separate, expanded version of the changes that might appear in department publications). **Please note:** all copy will be edited to reflect uniform style in the General Catalog.

See attached document "Proposed Catalog Copy".

APPROVALS

Chair/Program Director: Henry M. Levy	Date: 10-16-2009
College/School/Campus Curriculum Committee: Stuart Z	Date: 10/20/09
Dean/Vice Chancellor: Eve O. Roh	Date: 10/20/09
Faculty Council on Academic Standards/ General Faculty Organization/Faculty Assembly Chair: John Schaubberger	Date: Nov. 6, 2009

POST TRI-CAMPUS APPROVAL (when needed)

Faculty Council on Academic Standards/ General Faculty Organization/Faculty Assembly Chair:	Date:

Comp E

Justification of Change to Computer Engineering Program

This change encompasses a significant revision of the department's 300-level courses for students in the Computer Science and Computer Engineering majors. This is the most significant revision to the courses in over two decades. It results from a large committee effort and broad faculty/student input that began in earnest in January 2009. Students beginning the major in Spring 2010 or later will use the new courses and requirements.

Goals

The purpose of this revision is to *streamline* and *modernize* our undergraduate degree programs. We are responding to a computing field that continues to grow and advance at a fast rate. For streamlining, our goal was to reduce the number of courses all students must take so that students have the opportunity (but not the requirement) to take more advanced courses in a particular subfield sooner. We have not reduced the total number of CSE courses/credits that each student must take. That is, the degree is more flexible, but not smaller. For modernization, the new 300-level courses have roughly 30% new material, replacing material that has become less important. Before the revision, the Computer Science degree and the Computer Engineering degree required the same 300-level courses. There is now a 1-2 course difference in which courses are required, but there are still 4 courses that all students take, and in practice we expect even larger overlap once we consider courses that students take as electives.

New Courses

The degree-requirements revision is accompanied by 8 new courses (CSE 311, 312, 331, 332, 333, 344, 351, 352). Correspondingly, we will phase out 6 courses (CSE 303, 321, 322, 326, 370, 378) after a transition period over the next few academic quarters since current students have already taken some or all of these courses. The numbering scheme for the new courses is straightforward:

- Courses with a middle number of 1 focus on foundational material used across the discipline.
- Courses with a middle number of 3 focus on software.
- Courses with a middle number of 5 focus on hardware or the hardware/software interface.
- 344 relates closely to the current course 444 (see the new-course application for 344).

In addition, the change incorporates the new course E E 205 Intro to Signal Conditioning that is also being created at this time. E E 205 is an alternative to E E 215. More significantly, for the hardware specialization, E E 205 is an alternative that can replace E E 215 *and* E E 233, leaving room for more elective credits in CSE andE E.

Degree Requirements

Overall, the new degree requirements meet the following goals:

- They incorporate the new 300-level courses (and E E 205) while not radically changing the 400-level requirements
- They more explicitly ensure that all students will complete enough Math/Science and Engineering credits for ABET purposes
- They slightly increase the number of CSE Electives without decreasing the number of Free Electives.

The new Natural World requirement (3c) replaces what used to be STAT390,391, or STAT 394/5. The result is more flexible while ensuring that the degree includes enough Math/Science for ABET. Similarly, Major Requirement (3) more explicitly ensures that all students have enough ABET Engineering credits. Most students will have 27-29 Engineering credits from their specialization, leaving 2-4 additional credits. However, students could use up to 4 CSE Elective credits from outside the College, in which case they would need additional Engineering credits.

As discussed above, in the hardware specialization, E E 205 becomes an alternative to E E 215 and E E 233, without decreasing the total number of required CSE+E E credits; if students in this specialization choose E E 205 then they must take another CSE/E E course to fullfil their specialization requirements.

Other changes are entirely internal to CSE. Of note:

- CSE 333 (a new course) is required for the hardware specialization because it is a prerequisite for CSE 466, which is also required.
- CSE 331 (a new course) replaces CSE 403 as a software-specialization requirement because CSE 331 is a prerequisite for CSE 403. Although CSE 403 is no longer required of everyone, either CSE 403 or CSE 484 is required.

Course Lists

The degree requirements refer to 3 course lists from the CS&E Handbook. Copies of these lists are included as appendices.

- The CSE Core Course List is a new list. It is not referred to directly in the degree requirements, but the CSE Elective List explicitly includes every CSE Core Course. Note that this list includes optional 300-level CSE majors' courses.
- The CSE Electives List used to be called the "CSE Senior Electives List" but we have renamed it to reflect that it includes some 300-level CSE courses. It also has several small changes, listed below. The additions and removals better align the list with the criteria described at the beginning of the list. Note we also have a petition process for including other courses.
    - Additions: AMATH 482, MATH 307, STAT 390, STAT 391

    - Removals: GEOG 460 (no longer exists), GEOG 463 (no longer exists), HCDE 401
- The only change to the Approved Natural Science Course list is to reflect that BIOL 180 no longer has a chemistry prerequisite.

Changed Prerequisites

Because we are transforming the entire 300-level curriculum, the prerequisites for many of our other courses will need to change. This will occur in two stages: During a transition period, the prerequisites will account for students taking old or new 300-level courses. Later we will remove references to the old courses.

This 1503 does not implement either of these stages. Instead, we seek to put our new degree requirements and courses in place first. After this is completed and the new courses are in the catalog, we will make the changes to our prerequisites. For informational purposes to show that we have thought through the changes, a draft of the prerequisite changes is included as an appendix.

There is no need to do either stage now because no student can complete any new courses until Spring 2010.

Affected Departments

This curriculum revision primarily affects only the CSE department and its undergraduate majors, though there are a few external interactions. We have removed the requirement of a statistics course, allowing many mathematics, statistics, applied math, and natural science courses instead (the same statistics courses satisfy this more flexible requirement). We met with relevant members of the Statistics department to explain the changes and they expressed no particular problems with these changes. The new E E course described above has been developed by E E with some input from CSE, and they are aware of our changed degree requirements. We have also consulted with Electrical Engineering and Mathematics about courses that are closer to those disciplines (CSE 352 and CSE 311, respectively).

CURRENT CATALOG COPY

(Deletions ~~crossed out and in bold~~)

Computer Science

AC101 Paul G. Allen Center for Computer Science and Engineering

Computer science is the study of information and algorithms within the context of real and abstract computing devices. Computer scientists are interested in such topics as the representation and storage of information; algorithms to access, display, edit, and transform information; programming languages to express algorithms; and hardware and software processors to execute algorithms. These concerns lead to practical developments in computer systems software, such as operating systems and compilers; in application areas, such as artificial intelligence, computer graphics, and computational biology; and also to theoretical investigations of computers, algorithms, and data.

Computer engineering is a closely related field concerned with the design and practical application of computer hardware and software systems to the solution of technological, economic, and societal problems. The computer engineer analyzes a problem and selects from a variety of tools and technologies those most appropriate for its solution. A computer engineer can expect to be involved in hardware design, software creation, and systems integration.

Undergraduate Program

Adviser
101 Paul G. Allen Center for Computer Science and Engineering, Box 352350
206-543-1695
ugrad-advisor@cs.washington.edu

The Department of Computer Science and Engineering offers the following programs of study:

- The Bachelor of Science in Computer Engineering degree
- The Bachelor of Science degree with a major in computer science (see Computer Science section)

The core requirements of the two undergraduate majors are ~~**identical**~~. The computer engineering major may be more appropriate for students who are interested in creating and building systems that include both hardware and software components and that must be engineered to meet a variety of cost and performance constraints. The program includes a general foundation in engineering fundamentals to enable interdisciplinary work with other departments in the College of Engineering and the University as a

whole.

The computer science major may be more appropriate for students who want to earn a double major with another College of Arts and Sciences program (for example, mathematics or economics), who want the additional flexibility of the computer science requirements (the computer engineering major has more required courses and fewer electives), or who may be more interested in the theory, design, and implementation of software systems and applications (for example, the techniques of modern compilers or the algorithms behind computer graphics and animation).

Bachelor of Science in Computer Engineering

Suggested First- and Second-Year College Courses: MATH 124, MATH 125, MATH 126; PHYS 121, PHYS 122; CSE 142, CSE 143; English composition.

Department Admission Requirements

Applicants are considered in three groups: Direct Admission, Accelerated Admission, and Upper-division Admission. Admission is competitive. Completion of minimum requirements does not guarantee admission.

1. *Direct Admission:* Computer Science and Engineering enrolls up to 20 percent of its incoming class directly out of high school, prior to completion of university-level prerequisites. Freshman applicants to the University listing Computer Science or Computer Engineering as their intended major are automatically considered. Competitive applicants have taken calculus and at least one year of laboratory science (preferably physics) upon entering the University. Admission is for autumn quarter only.
2. *Accelerated Admission:* Intended as a fast track into the Computer Science and Engineering department for matriculated students who have excelled in the CSE introductory courses.
    a. *Course Requirements:* CSE 142 or equivalent, CSE 143. At least 5 additional credits toward the Computer Science Upper-division Admission course requirements.
    b. *Other Requirements:* Completion of at least 15 credits at the UW. 3.00 cumulative GPA. Competitive applicants for Accelerated Admission typically have received a high grade in CSE 143 at the UW on their first attempt.
    c. Admission is considered for any quarter.
3. *Upper-division Admission*
    a. MATH 124, MATH 125, MATH 126 (or MATH 134, MATH 135, MATH 136); at least five credits of Natural World, including one of the following: PHYS 121, CHEM 142/CHEM 145, (or any approved science course that requires ~~**PHYS 121 or CHEM 142/CHEM 145**~~ as a prerequisite); CSE 142, CSE 143; and at least five credits of English composition. In addition to any AP credit, at least one calculus or post-

calculus mathematics course and one approved Natural World courses must be completed prior to applying to the department.

b. Admission is for autumn or spring quarter. Application deadlines are July 1 for autumn quarter and February 1 for spring quarter.

Students may also declare into the Computer Engineering degree program through the College of Engineering Advanced Admission program (see the College of Engineering section for Advanced Admission entrance and continuation requirements).

Graduation Requirements

180 credits as follows:

General Education Requirements (~~81-84~~ credits)

1. *Written and Oral Communication (12 credits):* 5-credit course in English composition from the University-approved list; HCDE 231; HCDE 333, or department-approved alternative.
2. *Visual, Literary, & Performing Arts (VLPA) and Individuals & Societies (I&S) (30 credits):* A minimum of 10 credits in each required area.
3. *Natural World (~~39-42~~ credits):*
    a. *Mathematics (~~19-22~~ credits):* MATH 124, MATH 125, MATH 126 (or MATH 134, MATH 135, MATH 136); MATH 308 or MATH 318 (waived if MATH 136 taken)~~; MATH/STAT 390 or STAT 391 (or STAT 394, STAT 395)~~.
    b. *Science (20 credits):* PHYS 121, PHYS 122, and 10 additional credits from the list of approved natural science courses in the CS&E Handbook. ~~Courses that meet the department's science requirement include any course in biology, chemistry, physics, earth and space sciences, astronomy, or atmospheric sciences that requires PHYS 121 or CHEM 142/CHEM 145 as a prerequisite.~~

Major Requirements (~~74-75~~ credits)

1. *Required Courses (~~47~~ credits):* CSE 142, CSE 143, ~~CSE 303, CSE 321, CSE 322, CSE 326, CSE 341, CSE 370, CSE 378,~~ CSE 451, CSE 461; E E 215
2. Either a hardware or a software specialization
    a. *Hardware Specialization (~~28~~ credits):* ~~E E 233;~~ CSE 466, CSE 467; CSE 471; 5-credit course chosen from the list of CSE hardware capstone courses in the CS&E Handbook; and ~~6 credits from courses on the approved computer engineering senior elective course list in the CS&E Handbook.~~
    b. *Software Specialization (~~27~~ credits):* ~~CSE 403; 18 credits from the approved computer engineering senior elective course list in the CS&E Handbook, including at least three courses from CSE 401, CSE 421, CSE 444, CSE 466, CSE 471, CSE 484;~~ 5 credit course

chosen from the list of CSE software capstone courses in the CS&E Handbook.

3. Minimum 2.0 grade for any course applied to the major. Transfer students must earn a minimum of 24 graded credits toward the major at the UW.

Free Electives (21-25 credits)

PROPOSED CATALOG COPY

(New degree requirements: Additions underlined and in bold)

Computer Science

Undergraduate Program

Adviser
101 Paul G. Allen Center for Computer Science and Engineering, Box 352350
206-543-1695
ugrad-advisor@cs.washington.edu

The Department of Computer Science and Engineering offers the following programs of study:

- The Bachelor of Science in Computer Engineering degree
- The Bachelor of Science degree with a major in computer science (see Computer Science section)

The core requirements of the two undergraduate majors are **similar**. The computer engineering major may be more appropriate for students who are interested in creating and building systems that include both hardware and software components and that must be engineered to meet a variety of cost and performance constraints. The program includes a general foundation in engineering fundamentals to enable interdisciplinary work with other departments in the College of Engineering and the University as a whole.

The computer science major may be more appropriate for students who want to earn a double major with another College of Arts and Sciences program (for example, mathematics or economics), who want the additional flexibility of the computer science requirements (the computer engineering major has more required courses and fewer electives), or who may be more interested in the theory, design, and implementation of software systems and applications (for example, the techniques of modern compilers or the algorithms behind computer graphics and animation).

Bachelor of Science in Computer Engineering

Suggested First- and Second-Year College Courses: MATH 124, MATH 125, MATH 126; PHYS 121, PHYS 122; CSE 142, CSE 143; English composition.

Department Admission Requirements

Applicants are considered in three groups: Direct Admission, Accelerated Admission,

and Upper-division Admission. Admission is competitive. Completion of minimum requirements does not guarantee admission.

1. *Direct Admission:* Computer Science and Engineering enrolls up to 20 percent of its incoming class directly out of high school, prior to completion of university-level prerequisites. Freshman applicants to the University listing Computer Science or Computer Engineering as their intended major are automatically considered. Competitive applicants have taken calculus and at least one year of laboratory science (preferably physics) upon entering the University. Admission is for autumn quarter only.
2. *Accelerated Admission:* Intended as a fast track into the Computer Science and Engineering department for matriculated students who have excelled in the CSE introductory courses.
    a. *Course Requirements:* CSE 142 or equivalent, CSE 143. At least 5 additional credits toward the Computer Science Upper-division Admission course requirements.
    b. *Other Requirements:* Completion of at least 15 credits at the UW. 3.00 cumulative GPA. Competitive applicants for Accelerated Admission typically have received a high grade in CSE 143 at the UW on their first attempt.
    c. Admission is considered for any quarter.
3. *Upper-division Admission*
    a. MATH 124, MATH 125, MATH 126 (or MATH 134, MATH 135, MATH 136); at least five credits of Natural World, including one of the following: PHYS 121, CHEM 142/CHEM 145, **or BIOL 180** (or any approved science course that requires **one of these courses** as a prerequisite); CSE 142, CSE 143; and at least five credits of English composition. In addition to any AP credit, at least one calculus or post-calculus mathematics course and one approved Natural World courses must be completed prior to applying to the department.
    b. Admission is for autumn or spring quarter. Application deadlines are July 1 for autumn quarter and February 1 for spring quarter.

Students may also declare into the Computer Engineering degree program through the College of Engineering Advanced Admission program (see the College of Engineering section for Advanced Admission entrance and continuation requirements).

Graduation Requirements

180 credits as follows:

*General Education Requirements (**83** credits)*

1. *Written and Oral Communication (12 credits):* 5-credit course in English composition from the University-approved list; HCDE 231; HCDE 333, or department-approved alternative.

2. *Visual, Literary, & Performing Arts (VLPA) and Individuals & Societies (I&S) (30 credits):* A minimum of 10 credits in each required area.
3. *Natural World (**41** credits):*
    a. *Mathematics (**15-18** credits):* MATH 124, MATH 125, MATH 126 (or MATH 134, MATH 135, MATH 136); MATH 308 or MATH 318 (waived if MATH 136 taken).
    b. *Science (20 credits):* PHYS 121, PHYS 122, and 10 additional credits from the list of approved natural science courses in the CS&E Handbook.
    c. ***Mathematics or Science (3-6 credits):* 3 to 6 additional credits of Math/Science (to bring the total to 41) chosen from approved natural science courses in the CSE Handbook, STAT 390, 391, 394, MATH 307, 309, 334, 335, and AMATH 351, 353. (STAT 391 recommended.)**

*Major Requirements (**72** credits)*

1. *Required Courses (**41** credits):* CSE 142, CSE 143, **CSE 311, CSE 312, CSE 332, CSE 351, CSE 352,** CSE 451, CSE 461; E E 215 **or E E 205**
2. Either a hardware or a software specialization
    a. *Hardware Specialization (**28-29** credits):* **CSE 333,** CSE 466, CSE 467; CSE 471; 5-credit course chosen from the list of CSE hardware capstone courses in the CS&E Handbook; and

        - **If E E 205 is not taken, then E E 233 and at least 3 credits chosen from courses on the CSE Electives list in the CS&E Handbook**
        - **If E E 205 is taken, then at least 7 credits chosen from courses on the CSE Electives list in the CS&E Handbook, including at least 3 credits from courses in the CSE or EE departments.**

    b. *Software Specialization (**27-28** credits):* **CSE 331; 3 courses chosen from CSE 401, CSE 403, CSE 421, CSE 444, CSE 466, CSE 471, and CSE484, at least one of which must be either CSE 403 or CSE 484;** 5 credit course chosen from the list of CSE software capstone courses in the CS&E Handbook; **at least 7 credits chosen from courses on the CSE Electives list in the CS&E Handbook, including at least 3 credits from courses in the CSE or EE departments**
3. **A total of at least 31 credits from any regularly numbered courses with a College of Engineering prefix, including credits toward the hardware or software specialization, but not including the Required courses or courses applied to the Written and Oral Communication requirements.**
4. Minimum 2.0 grade for any course applied to the major. Transfer students must earn a minimum of 24 graded credits toward the major at the UW.

Free Electives (21-25 credits)

Appendix: Course Lists

The degree requirements refer to 3 course lists. This page lists the new CSE Core Course List. On the following pages are the revised CSE Elective List and the (unchanged) Approved Natural Science Course List.

CSE Core Course List

(See notes below as necessary.)

CSE 331 Software Design & Implementation (1)
CSE 333 Systems Programming (2)
CSE 341 Programming Languages
CSE 344 Intro to Data Management
CSE 352 Hardware Design & Implementation (3)
STAT 391 Probability & Statistics for Computer Science
CSE 401 Intro to Compiler Construction
CSE 403 Software Engineering
CSE 421 Intro to Analysis of Algorithms
CSE 427 Computational Biology
CSE 431 Intro to Complexity
CSE 440 Intro to HCI
CSE 444 Intro to Database Systems
CSE 446 Machine Learning
CSE 451 Intro to Operating Systems
CSE 455 Computer Vision
CSE 457 Computer Graphics
CSE 461 Computer Networks
CSE 466 Software for Embedded Systems
CSE 467 Advanced Digital Design
CSE 471 Computer Design and Org
CSE 473 Artificial Intelligence
CSE 484 Computer Security

(1) Required for Computer Science and Computer Engineering Software Specialization; therefore does not count as elective credit for Computer Science or the software specialization.

(2) Required for Computer Engineering Hardware Specialization; therefore does not count as elective credit for this specialization.

(3) Required for Computer Engineering; therefore does not count toward elective credit for Computer Engineering

CSE Electives List

A CSE elective is a course that has a significant overlap with computer science and engineering, either because it focuses on a significant application or use of computers, it focuses on an underlying technology for computers or communication, or it develops a conceptual or formal framework useful in doing computer science and engineering.

Courses not on this list may be applied toward CSE (senior) electives if approved by the CSE Undergraduate Faculty Advisor. If you would like to petition to have a class count toward (senior) electives, please contact the undergrad advisors.

Note: Computer Engineering majors may not use the same course to satisfy Math/Science electives and Computer Engineering or Free Electives.

Any course on the CSE Core Course List is also a CSE Elective

Any graded 400-level CSE majors course is a CSE Elective (includes 498 but not 499)

Courses from other departments:

AMATH	401	Vector Calculus & Complex Variables (4)
	402	Introduction to Dynamical Systems & Chaos (4)
	403	Methods for Partial Differential Equations (4)
	422	Introduction to Mathematical Biology (3)
	423	Mathematical Biology: Stochastic Models (3)
	482	Computational Methods for Data Analysis (5)
BIOEN	303	Bioengineering Signal Processing (4)
	485	Computational Bioengineering (4)
DXARTS/ MUSIC	461-463	Digital Sound, Digital Sound Synthesis, Digital Sound Processing (5, 5, 5). Offered jointly with Music 401-403.
EE	331, 332	Devices and Circuits I & II (5, 5)
	341	Discrete Time Linear Systems (5)
EE	400-level	Any 400-level majors course *with the exception of:* EE 406, 452-457, 471, 472, 478, 491, and 499.
ENGR (Co-op)	321	Engineering Cooperative Education (one credit may count for Computer Science majors; three credits may count for Computer Engineering majors)
GEOG	465	GIS Database & Programming (5)
HCDE	407	Software User Assistance (5)
HCDE/IE	455	User Interface Design (4)

INFO	444	Value-Sensitive Design (5)
	446	Advanced Search Engine Systems (5)
	454	Information Policy: Domestic and Global (5)
LING	473	Basics for Computational Linguistics (3)

(continued on next page)

MATH	307	Introduction to Differential Equations
	334, 335, 336	Accelerated Advanced Calculus (5,5,5)
	402, 403, 404	Introduction to Modern Algebra (3, 3, 3)
	407	Linear Optimization (3)
	408	Nonlinear Optimization (3)
	409	Discrete Optimization (3)
	414, 415	Number Theory (3,3)
	424, 425, 426	Fundamental Concepts of Analysis (3,3,3)
	435, 436	Introduction to Dynamical Systems (3,3)
	441	Topology (3)
	442	Differential Geometry (3)
	461, 462	Combinational Theory (3,3)
	464, 465, 466	Numerical Analysis I, II, III (3, 3, 3)
MUSIC	400	Computer Applications to Music (3, max 9)
STAT	341, 342	Introduction to Probability and Statistical Inference I, II (4,4)
	391	Probability and Statistics for Computer Science (4). (See note below.)
	421	Applied Statistics and Experimental Design (4)
STAT/MATH	390	Probability and Statistics in Engineering and Science (4). (See note below.)
	395, 396	Probability II & III (3,3)
	491	Introduction to Stochastic Processes (3)

Note: Only one of STAT 391 and MATH/STAT 390 may count toward CSE Elective credit.

Approved list of science courses for CSE

Courses that meet the department's science requirement include Physics 121, Chemistry 142/145, Biology 180 and the following list of courses.

Check with a CSE adviser about courses that are not included in this list, but which require Physics 121, Chemistry 142/145, Biology 180 as a pre-requisite.

Biology

BIOL 180
BIOL 200
BIOL 220

Must take one of the three above as a prerequisite to the following (when required)
BIOL 325, 333, 340, 354, 355, 356, 401, 402, 403, 405, 407, 408, 409, 411, 412, 413, 414, 415, 425, 426, 427, 433, 434, 435, 437, 440, 441, 442, 443, 444, 446, 452, 454, 455, 459, 462, 463, 464, 471, 472, 473, 474, 475, 476, 477, 479, 480.

Chemistry

CHEM 142, 144, 152, 155, 162, 165, 220, 221, 223, 224, 237, 238, 239, 241, 242, 312, 317, 321, 335, 336, 337, 346, 347, any graded 400 level CHEM course

Physics

PHYS 121, 122, 123, 224, 225, 227, 228, 231, 232, 311, 315, 321, 322, 323, 324, 325, 328, 331, 334, 335, 407, 408, 421, 422, 423, 424, 425, 426, 434, 460.

Earth & Space Sciences

ESS 212, 213, 313, 403, 412, 413, 414, 415, 424, 431, 437, 438, 456, 458, 463, 464, 466, 467, 471,

Astronomy

ASTR 301, 321, 322, 323, 423, 480, 481

Atmospheric Science

ATM S: 301, 321, 358, 370, 451, 452, 458, 460, 480

Appendix: Subsequent Prerequisite Changes

As explained in the justification, the new 300-level curriculum necessitates changing the prerequisites for 400-level courses in two stages. Though we are not implementing either stage now, this information indicates how the pre-requisites will change.

Course	Current	Stage 1	Stage 2
CSE 373	CSE 143, no credit after 326	CSE 143, no credit after 326 or 332	CSE 143, no credit after 332
CSE 374	CSE 143, no credit after 303	CSE 143, no credit after 303 or 333	CSE 143, no credit after 333
CSE 401	CSE 322, 326, 341, 378, no credit after 413	(CSE 326 **and** CSE 378) **or** (CSE 332 **and** CSE 351)	CSE 332, CSE 351
CSE 403	CSE 303, 326, 341, project experience recommended	(CSE 303 **or** CSE 331) **and** (CSE 326 **or** CSE 332), project experience recommended (331 qualifies)	CSE 331, 332
CSE 410	CSE 373, no credit after 378 or 451	CSE 373, no credit after 378, 351, or 451	CSE 373, no credit after 351
CSE 421	CSE 322, 326	(CSE 322 **or** CSE 312) **and** (CSE 326 **or** CSE 332)	CSE 312, 332
CSE 427	CSE 326	CSE 326 **or** CSE 332	CSE 312 and CSE 332
CSE 428	CSE 326	(CSE 303 **or** CSE 331) **and** (CSE 326 **or** CSE 332)	CSE 331 and CSE 332
CSE 431	CSE 322	CSE 322 or CSE 312	CSE 312
CSE 440	CSE 326	CSE 326 or CSE 332	CSE 332
CSE 444	CSE 303, 326	(CSE 303 **or** CSE 331) **and** (CSE 326 **or** CSE 332)	CSE 332, (CSE 344 or permission of instructor), recommended: CSE 331 or CSE 333 or substantial software-project experience
CSE 446	CSE 326 **and** (STAT 390 **or** STAT 391)	(CSE 326 **or** CSE 332) **and** (STAT 390 **or** STAT 391 **or** CSE 312)	CSE 312, CSE 332, recommended: STAT 390 or STAT 391
CSE 451	CSE 326, 378, no credit after CSE 410 or EE 474	(CSE 378 **or** CSE 351) **and** (CSE 326 **or** CSE 332), recommended: CSE 303 or CSE 333, no credit after CSE 410 or EE 474	CSE 332, CSE 351, recommended: CSE 333, no credit after CSE 410 or EE 474
CSE 454	CSE 326	CSE 326 or CSE 332	CSE 332

CSE 455	CSE 303, CSE 326, recommended: MATH308	(CSE 303 **or** CSE 333) **and** (CSE 326 **or** CSE 332), recommended: MATH308, STAT 391	CSE 333, CSE 332, recommended: MATH308, STAT 391
CSE 457	CSE 303, CSE 326, recommended: MATH308	(CSE 303 **or** CSE 333) **and** (CSE 326 **or** CSE 332), recommended: MATH308	CSE 333, CSE 332, recommended: MATH308
CSE 461	CSE 326	(CSE 326 **or** CSE 332) **and** (CSE 303 **or** CSE 351); recommended CSE 303 or CSE 333	CSE 332, CSE 351, recommended: CSE 333
CSE 466	CSE 326, CSE 370, CSE 378	(CSE 378 **or** CSE 352) **and** (CSE 303 **or** CSE 333)	CSE 352, CSE 333
CSE 467	CSE 326, CSE 370	(CSE 370 or CSE 352) recommended: (CSE 326 or CSE 332)	CSE 352, recommended: CSE 332
CSE 468	CSE 370	CSE 370 or CSE 352	CSE 352
CSE 471	CSE 370, CSE 378	CSE 378 or CSE 352	CSE 352
CSE 472	(LING200 **or** LING400) **and** (LING461 **or** CSE 321), joint with LING472	(LING200 **or** LING400) **and** (LING461 **or** CSE 321 **or** CSE 311), joint with LING472	(LING200 **or** LING400) **and** (LING461 **or** CSE 311), joint with LING472
CSE 473	CSE 326, recommended: 341	(CSE 326 **or** CSE 332), recommended: STAT 390 **or** STAT 391 **or** CSE 312	CSE 312, CSE 332, recommended: STAT 390 or STAT 391
CSE 481	CSE 326, 341, 378, substantial programming experience, such as in CSE 451 or CSE 457	(CSE 341 **or** CSE 331) **and** (CSE 326 **or** CSE 332) **and** (CSE 378 **or** CSE 351), substantial programming experiences, such as in CSE 451 or CSE 457	CSE 331, 332, 351, substantial programming experience, such as in CSE 451 or CSE 457
CSE 484	CSE 326, 378	(CSE 326 **or** CSE 332 **or** CSE 312) **and** (CSE 378 **or** CSE 351)	CSE 312, 351