COMPUTER SCIENCE HANDBOOK
for UNDERGRADUATES
1992–1993

Department of Computer Science and Engineering
University of Washington
114 Sieg Hall, FR-35
Seattle, Washington 98195
(206) 543-1695
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• Courses in the **systems** area are concerned with the logical structure ("architecture") of computer systems and with the design and implementation of computer system software, such as operating systems and compilers. In contrast to theory courses, where you may do no actual programming, an important component of learning in the systems area is implementation. Courses in this area give the student better understanding of the technological implementations of computers.

• Courses in the **applications** area deal with computers as tools to solve problems. Examples of topics in this area are artificial intelligence, computer graphics, and databases.

The purpose of the education provided by our Department is to produce Computer Scientists and Computer Engineers, as contrasted with computer users. The undergraduate programs are designed to prepare students for professional careers or graduate study. We are especially concerned with providing our students with a foundation that will not become obsolete as technology advances and changes.

Upon graduation, our students are well prepared for either of two possible futures. One is graduate study. Our students are regularly accepted by the best graduate departments in the country. Another is a career requiring persons highly skilled in designing, analyzing, implementing, and maintaining hardware and software systems. Typical employers for such people include computer hardware and software manufacturers (Digital Equipment Corporation, Intel, Microsoft, Apple, IBM, Xerox, Boeing, Bell Communications Research, Tektronix, U.S. West, Weyerhaeuser, and Hewlett-Packard, to name but a few), companies relying heavily on the development of computerized systems (e.g., Tektronix, Weyerhaeuser, John Fluke, Bell Northern Research, Boeing, and Lucas Films), and myriad other companies that are involved with computer consulting or that own substantial computing facilities. In short, the student is prepared for jobs in which the skilled element is a thorough understanding of computing.

Computer Science leads itself nicely to double majors. Many fields require the use of the computer as a tool. Consider economics. The primary skill in this case would be in understanding economic models and forecasting (which must be gained through earning an economics degree). Most modeling is currently done using computers, so strength in Computer Science might also be useful, depending on the degree to which you are involved in constructing the computer models. This symbiotic relationship holds between Computer Science and most other fields as well. However, due to the large overlap, a double major of Computer Science with Computer Engineering is not allowed.

1.2 The Honors Program

An Honors Program for Computer Science majors in Arts and Sciences was established in 1977. Students may graduate 'with College Honors' by completing both the college honors requirements AND the computer science honors requirements or they may graduate 'with Distinction' by completing only the Departmental honors requirements. Details on the Honors Program appear in Section 4.

1.3 Courses for Non-Majors

The Department of Computer Science offers several courses for non-computer science majors. Currently, these include CSE/ENGR 142, 143, 373, 410, 413, and 415. Non-Computer Science majors may petition CSE courses. Forms must be submitted by the week before the quarter begins. Because decisions are usually made during the first week of the quarter, students should plan to attend petitioned classes during that week.

1.4 Minor/Mathematical Sciences Option

It is possible to earn a BS degree with a Mathematical Sciences option with Computer Science being the science option. Application should be made early in your academic career through the Math Department, C36 Padelford.

If you are considering a minor in CSci, available through the College of Education, you should see an advisor in the Office of Teacher Education Advising, 211 Miller Hall.

1.5 Relation between the Computer Science and Computer Engineering Degrees

This handbook contains information about the undergraduate program in Computer Science (CS), offered through the College of Arts and Sciences. The department also offers an undergraduate program in Computer Engineering (CompE), through the College of Engineering. Both programs lead to a Bachelor of Science degree. For detailed information on the CompE degree, please refer to the handbook entitled "Computer Engineering Handbook for Undergraduates."

Computer Science and Computer Engineering are closely related. Many of the Department's junior courses are required of both CS and CompE majors, and many of the senior courses are taken by students in both majors. However, there are a number of differences between the two degree programs. The key differences are as follows:

1. CS students must satisfy the College of Arts and Sciences distribution requirements; CompE students must satisfy the College of Engineering distribution requirements. There is a total of 180 credits required for the CS degree, and 192 for the CompE degree.
2. CompE requires substantially more courses in computer hardware and electrical engineering than CS (25 additional credits).
3. CS requires more theory than CompE (3 additional required credits, and up to 6 additional credits in the "outer core" of the CS curriculum).
4. Both degrees require a certain number of credits of senior elective courses in the major or a closely related field (21 credits for CompE; 9 for CS). The list of CompE required and elective courses includes all the electives on the CS elective list, plus any 400-level major course in Electrical Engineering (EE).
The CS major is more appropriate for students who want to have a double major with another Arts and Sciences program (for example, Mathematics or Economics), who want the additional flexibility of the CS requirements (the CompE major has more required courses and fewer electives), or who want more theory of computation. The CompE major is more appropriate for students interested in building systems that include both custom hardware and software components, who have strong interests in EE, or who specifically want an Engineering degree.

Both CS and CompE graduates have had excellent success in finding positions after graduation. Many positions are equally suitable for graduates with either degree. A CS degree would be an advantage for a position needing the knowledge of a double major with another Arts and Sciences area (for example, CS and Economics, or CS and Mathematics), or additional liberal arts background. A CompE degree would be an advantage for a position involving designing and building systems with a combination of software and custom hardware. Also, some larger, engineering-oriented manufacturing companies favor CompE over CS degrees. For graduate study in Computer Science, or in Computer Science and Engineering, either degree is suitable—the quality of the applicant would be the determining factor for admission.

Admissions for CS and CompE are handled separately. Both are competitive, with more qualified applicants than spaces available.

1.6 Computing and Laboratory Facilities

The focus of our program is to teach concepts and principles that go beyond any individual class of hardware devices or computers. However, we also realize that providing our students with state-of-the-art equipment is an essential part of the curriculum, as well as being motivational and fun. We currently have a variety of equipment available for use in undergraduate classes. The primary lab for instructional computing contains approximately four dozen X-terminals, backed by two DECstation 5000s (RISC-based systems) running Unix. The X-terminals include Tektronix grayscale and color terminals and VAXterminals 2000 workstations configured to operate as monochrome X-terminals. To support our hardware courses, the department operates a design laboratory consisting of 16 MacIntosh IIs and Tektronix logic analyzers and other test equipment. Students working on senior and honors projects may have access to more advanced equipment in the department, including parallel processors, VLSI design tools, and graphics and image processing equipment. All Computer Science students have access to campus, national and international networks.

1.7 Further Information and Advice

Handouts concerning the undergraduate programs are available in the Computer Science and Engineering main office, 114 Sieg Hall. The Department also holds monthly orientation meetings for prospective Computer Science applicants. Further information about these meetings, including a time schedule, can be obtained from the receptionist in the main office. In addition, the receptionist can make an appointment for you to see the Computer Science Undergraduate Staff Advisor, whose office is also in 114 Sieg, and who is responsible for day-to-day advice and information pertinent to curriculum. The Undergraduate Staff Advisor may also refer you to the Undergraduate Faculty Advisor, a faculty member in the Department who is responsible for the overall direction of the undergraduate program.

2 Admissions Procedures

2.1 Prerequisites for Application

Any student applying to the Department of Computer Science Undergraduate Program should have completed the following requirements prior to application. (See the following section for application deadlines.)

1. Earn a minimum of 45 Quarter credits, applicable towards a Bachelor's Degree.
2. Complete the following courses: Math 124, 125, and 126; Physics 121, 122, and 123; CSE/ENGR 142, and CSE 143, or CSE 216, CSE 211.
3. Have at least a 3.0 as your overall GPA. Your overall GPA is the average of all transfer units and all UW units combined.
4. Be currently enrolled as a student at the University of Washington, or have made application to enroll through the Office of Admissions, 320 Schmitz.

2.2 Application Information

Each applicant is responsible for providing the Undergraduate Academic Counselor with the following items prior to the deadline date.

1. A completed application form. (Application is attached at the center of this brochure.)
2. A statement of purpose, approximately 200 words (neatly presented), that describes motivation, goals, related work experience, special circumstances not evident from transcripts, explanation of non-UW transcripts, etc.
3. Copies of complete transcripts from ALL universities and colleges attended (official transcripts or legible copies will be accepted).

The deadline date for completed applications depends on the quarter in which you wish to start as a major. For students wishing to enter the program starting in Autumn Quarter, the deadline is the preceding July 1st. For students wishing to enter the program starting in Spring Quarter, the deadline is the preceding January 15th.

Under no circumstances will students who are admitted to the undergraduate program be permitted to delay their entrance to the program. Students not entering on schedule will be required to reapply and are not guaranteed admission by virtue of their previous acceptance.
2.3 Selection Process

The Computer Science Undergraduate Admissions Committee meets shortly after application deadlines to select students for admission. Enrollment is limited due to space, faculty, and budgetary limitations. Those applicants who, in the judgment of the admissions committee, are most likely to succeed in the program and contribute to the field will be admitted. Selection is made primarily on the basis of scholastic achievement and potential. Other selection criteria, such as related work experience, is also considered. Applicants are notified of their admission or denial by letter 4-6 weeks after the above deadlines. Students who are denied admission may discuss their applications by meeting with either the Undergraduate Academic Counselor or the Undergraduate Faculty Advisor.

3 Information for Majors

3.1 Requirements for a Degree of Bachelor of Science

There are three components (180 credits total):

1. GENERAL EDUCATION COMPONENT (90 credits): This consists of the distribution requirements defined by the college and the university. Some courses specifically required in other components may apply to these distribution requirements. The Department strongly recommends that students take 10 credits of Natural Science, Business, or Engineering in addition to the natural science distribution requirement.

2. PREPARATORY COMPONENT (30 credits):
   - Physics (12 credits): Physics 121, 122, 123. (Mechanics, Electromagnetism and Oscillatory Motion, Waves).
   - Math (24 credits): Math 124, 125, 126. (Calculus with Analytic Geometry) and 3 courses selected from Math 307, 308, 309; any of the Math or Statistics courses in the senior electives component; or Stat/Econ 311.
   - Electronics (3 credits): One of Physics 334, EE 306, 310, or 355.

3. COMPUTER SCIENCE MAJOR COMPONENT (51 credits): To graduate, a grade of at least 2.0 must be received in each course in the major component.
   - Inner Core Component (30 credits): Majors must take all of these classes: CSE/ENGR 142, CSE 143, 321, 322, 326, 341, 378.
   - Outer Core Component (12 credits): Majors must select at least 12 credits of these classes: CSE 401, 421, 431, 451, 379 or 470 (but not both), 473.
   - Senior Elective Component (9 credits): Majors must select at least 9 credits from courses in the following groups: 400-level CSE courses (not including those used to satisfy the Outer Core), up to 6 credits of CSE 408 Senior Project (Honors students must take exactly 9 credits), and courses chosen from the approved senior elective course list (included below). Courses not on the list can still apply toward the senior elective component, subject to approval by the Undergraduate Faculty Advisor.

CSE 210 may be substituted for CSE/ENGR 142, and CSE 211 may be substituted for CSE 143 for any requirement or prerequisite. (CSE 210 and 211 are no longer offered, but some students may have taken these courses in previous years.)

It is recommended, but not required, that students augment their Computer Science major with concentrated work in Physics, Mathematics, Economics, or Electrical Engineering. Although computers are worth studying in themselves, they are also used as tools by other disciplines. Therefore, knowledge of another discipline will allow computer scientists to apply their expertise in computers to that discipline. For students planning to go to graduate school in Computer Science, it is suggested that they take additional courses in Mathematics, emphasizing senior level courses in abstract algebra, analysis, logic, probability, and statistics.
## 3.2 Approved Senior Electives

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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</thead>
<tbody>
<tr>
<td>CSE 403</td>
<td>Software Engineering (4)</td>
</tr>
<tr>
<td>CSE 440</td>
<td>Computer-based Simulation Models (3)</td>
</tr>
<tr>
<td>CSE 444</td>
<td>Introduction to Database Systems (3)</td>
</tr>
<tr>
<td>CSE 457</td>
<td>Computer Graphics (8)</td>
</tr>
<tr>
<td>CSE/EE 454</td>
<td>Intro to Computer Communication Networks (3)</td>
</tr>
<tr>
<td>CSE/Ling 472</td>
<td>Computational Linguistics (3)</td>
</tr>
<tr>
<td>CSE 471</td>
<td>Computer Design and Organization (4)</td>
</tr>
<tr>
<td>CSE 477</td>
<td>Digital System Design (5)</td>
</tr>
<tr>
<td>CSE 490</td>
<td>Special Topics in CSE (3)</td>
</tr>
<tr>
<td>CSE 498</td>
<td>Senior Project (Var)</td>
</tr>
<tr>
<td>EE 417,418</td>
<td>Introductory Communication Theory (4,3)</td>
</tr>
<tr>
<td>EE 476</td>
<td>Computer Aided Design of Digital Systems (3)</td>
</tr>
<tr>
<td>EE 478</td>
<td>Design of Computer Subsystems (5)</td>
</tr>
<tr>
<td>EE 479</td>
<td>Microcomputer System Design (5)</td>
</tr>
<tr>
<td>Geog 410</td>
<td>GIS Analysis (5)</td>
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<td>Geog 463</td>
<td>GIS Workshop (3.5)</td>
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<tr>
<td>Geog 465</td>
<td>Analytical Cartography (5)</td>
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<tr>
<td>Info Sys 460,461</td>
<td>Systems Analysis and Design I,II (4,4)</td>
</tr>
<tr>
<td>Ling/Anth 461,462</td>
<td>Syntax (4,4)</td>
</tr>
<tr>
<td>Ling/Phil 479</td>
<td>Formal Semantics and Natural Language (3)</td>
</tr>
<tr>
<td>Math 402,403,404</td>
<td>Introduction to Modern Algebra (3,3,3)</td>
</tr>
<tr>
<td>Math 407</td>
<td>Linear Optimization (3)</td>
</tr>
<tr>
<td>Math 408</td>
<td>Nonlinear Optimization (3)</td>
</tr>
<tr>
<td>Math 409</td>
<td>Discrete Optimization (3)</td>
</tr>
<tr>
<td>Math 414,415</td>
<td>Number Theory (3,3)</td>
</tr>
<tr>
<td>Math 401,402</td>
<td>Combinatorial Theory (3,3)</td>
</tr>
<tr>
<td>Math 404,405,406</td>
<td>Numerical Analysis I,II,III (4,4,4)</td>
</tr>
<tr>
<td>Math/EE 477</td>
<td>Microcomputers in Mechanical Systems (4)</td>
</tr>
<tr>
<td>Music 456</td>
<td>Musical Applications of Digital Processing (3)</td>
</tr>
<tr>
<td>Physics 434</td>
<td>Appl. of Computers to Physical Meas. (3)</td>
</tr>
<tr>
<td>Physics 361</td>
<td>Introduction to Probability &amp; Statistics (5)</td>
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<tr>
<td>Statistics 341,342</td>
<td>Introduction to Prob &amp; Stat Inference I,II (4,4)</td>
</tr>
<tr>
<td>Statistics 390</td>
<td>Prob &amp; Stat in Eng &amp; Science (4)</td>
</tr>
<tr>
<td>Statistics 421</td>
<td>Intro to Applied Stat &amp; Experimental Design (4)</td>
</tr>
<tr>
<td>Stat/Econ 481</td>
<td>Intro to Math, Statistics (5)</td>
</tr>
<tr>
<td>Stat/Math 394,395</td>
<td>no credit if credit received for Stat 341 or 390</td>
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<tr>
<td>Stat/Math 491,492</td>
<td>Probability I, II (3,3)</td>
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<tr>
<td>TC 301</td>
<td>Introduction to Stochastic Processes (3,3)</td>
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<tr>
<td>TC 306</td>
<td>Style in Scientific and Technical Writing (3)</td>
</tr>
<tr>
<td>TC 307</td>
<td>Computer Documentation (3)</td>
</tr>
<tr>
<td>TC 406</td>
<td>Special Documents: Proposals, EIS, and Manuals (3)</td>
</tr>
<tr>
<td>TC 409</td>
<td>Writing for Publication (3)</td>
</tr>
</tbody>
</table>
3.3 Scheduling

Here is a suggested schedule of 300-level courses for new majors:

Majors entering in Autumn quarter

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Course 1</th>
<th>Course 2</th>
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<tbody>
<tr>
<td>Autumn</td>
<td>CSE 321</td>
<td>CSE 378</td>
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<tr>
<td>Winter</td>
<td>CSE 322</td>
<td>CSE 326</td>
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<tr>
<td>Spring</td>
<td>CSE 341</td>
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</tbody>
</table>

Majors entering in Spring quarter

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Course 1</th>
<th>Course 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring</td>
<td>CSE 321</td>
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</tr>
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<td>Autumn</td>
<td>CSE 322</td>
<td>CSE 326</td>
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<tr>
<td>Winter</td>
<td>CSE 341</td>
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</tbody>
</table>

However, majors may take courses in another order, as long as they have the needed prerequisites.

3.4 Graduation Application/Exit Interview

At least two quarters before completing the requirements for your BS degree, you should make an appointment with the Undergraduate Staff Advisor to apply for graduation. Also at that time you will be asked to complete a brief questionnaire about the department. It can be completed in a few minutes and will be helpful to the department in responding to the many questions we receive. It will also help us to build a stronger program and be of assistance to future students.

3.5 Engineering Co/op Program

The Engineering Cooperative Education and Minority Intern Program, located in 353 Leow Hall, aids students interested in regular short term employment in local industry while studying at the University. For more information on the program contact Helene Beaver at 542-5711.

3.6 Center for Career Services

The University’s Center for Career Services, located in 361 Leow Hall, offers extensive services for students searching for career and job opportunities. Many local, national, and international companies send recruiters to campus each year to interview students in Computer Science and other disciplines.

4 Computer Science Honors Program

The Honors Program was established in 1977 for undergraduates in the College of Arts and Sciences. Requirements for entry are:
3.3 Scheduling

Here is a suggested schedule of 300-level courses for new majors:

Majors entering in Autumn quarter

Autumn  CSE 321  CSE 378
Winter   CSE 322  CSE 326
Spring   CSE 341

Majors entering in Spring quarter

Spring  CSE 321  CSE 378
Autumn  CSE 322  CSE 326
Winter  CSE 341

However, majors may take courses in another order, as long as they have the needed prerequisites.

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<td>Intro to Comp</td>
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<td>EE 417</td>
<td>Intro to EE</td>
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<td>EE 418</td>
<td>Intro to EE</td>
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<td>EE 476</td>
<td>Compute</td>
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<td>Design</td>
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<td>EE 479</td>
<td>Microcosm</td>
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<td>Geog 460</td>
<td>GIS Anns</td>
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<td>Math 414,415</td>
<td>Number</td>
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<tr>
<td>Math 464,465,466</td>
<td>Combine</td>
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<td>Mech E 477</td>
<td>Microcosm</td>
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<td>Music 456</td>
<td>Musical</td>
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<td>Physics 434</td>
<td>Appl of Quan Sc</td>
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<td>Physics 381</td>
<td>Intro to Stat</td>
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<td>Stat/Act 481</td>
<td>Intro to Stat</td>
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<td>Stat/Math 394,395</td>
<td>Probabil</td>
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<tr>
<td>Stat/Math 491,492</td>
<td>Intro to Stat</td>
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<td>TC 401</td>
<td>Style in</td>
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<td>TC 405</td>
<td>Compute</td>
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<td>Special I</td>
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<tr>
<td>TC 409</td>
<td>Writing</td>
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</tbody>
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NAME  
last  
first  
m.i.  

STUDENT #  

QUARTER APPLYING  

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING  
APPLICATION FOR ADMISSION - UNDERGRADUATE COMPUTER SCIENCE DEGREE PROGRAM  
114 SIEG HALL FR-35 (543-1695)  

Local Address     Number & Street     Permanent Address     Number & Street  
City     State     Zip     City     State     Zip  

Phone: Home     Work  

Have you Applied to this department before?  
Yes  No  

If yes, when?  Quarter     Year  

APPLICATION DEADLINE DATES  
Autumn Quarter - July 1  
Spring Quarter - January 15  

(Optional)  
American Indian or Alaska Native  
Asian or Pacific Islander  
Black  
Other  

Gender:  
Female  Male  

Disability/Handicap:  
Yes  No  

Veteran:  
Vietnam Era  Other  

Birthdate: (Mo., Day, Yr.)  

MINIMUM PRE-SELECTION REQUIREMENTS  

1. Have you been admitted to the U.W. Yes  No  
   Submitted an application to U.W. Admissions Office, 320 Schmiz  
   Yes  No  Date  

2. Have you earned at least 45 quarter credits applicable toward a  
   B.S. Degree? Yes  No  
   Number of credits earned to date  

3. Overall U.W. GPA  Overall Transfer GPA  

4. Have you completed the following (or equivalent):  
   Gtr/Yr taken  Grade School  
   Math 124  
   Math 125  
   Math 126  
   Physics 121  
   Physics 122  
   Physics 123  
   CSE/ENGR 142 or  
   CSE 210  
   CSE 143 or  
   CSE 211  

For office use  

GPA for above listed prerequisites  

9/91
1. An overall GPA of at least 3.3.
2. A GPA of at least 3.6 for all courses in the Computer Science core and elective components.
3. Affiliation with the College of Arts and Sciences.

To graduate with honors, a student must:
1. Maintain the above cumulative grade-point averages.
2. Take nine credits of CSE 498H, and complete a Senior Thesis, which must satisfy the following requirements:
   (a) It should be a typed or computer-generated document clearly and clearly presented.
   (b) It should be work done independently by the student under the supervision of a faculty member. The work should be original and demonstrate creative thinking, as judged by the faculty supervisor and the Undergraduate Faculty Advisor.
   (c) Final approval of the thesis must be obtained from the faculty supervisor and the Undergraduate Faculty Advisor.

Students who qualify for the Honors Program should request the appropriate form from the Undergraduate Staff Advisor.

Honors is noted on your diploma.

5 Computer Science and Engineering Courses for Pre-majors and Non-majors

CSE/ENGR 142 Computer Programming I (4)
Computer programming in a high-level language. Emphasizes algorithmics (variables, expressions, statements); abstraction (data types, subprograms, packages, generics); analysis (correctness, efficiency, numerics). Program design and analysis; specification, coding, documentation, testing, debugging, evaluation. Mostly in Ada, including FORTRAN, using software tools.

CSE 143 Computer Programming II (5)
Continuation of CSE/ENGR 142. New topics include analyzing algorithms; using/writing standard software components (queues, stacks, and tables) implemented by private types, generic packages, and dynamic data structures (lists and trees); recursive data-and-control structures. The last 2 weeks survey topics in computer science. Prerequisite: CSE/ENGR 142.

CSE 373 Data Structures and Algorithms (3)
Fundamental algorithms and data structures for their implementation. Techniques for solving problems by programming. Linked lists, stacks, queues, directed graphs. Trees: representations and traversals. Searching (hashing, binary search trees, multiway trees). Garbage collection, memory management. Internal and external sorting. Prerequisite: CSE 143. No credit if CSE 396, CSE 374, or EE 374 has been taken.

CSE 374 Data Structures for Engineers (3)
Fundamental algorithms, and data structures for their implementation. Techniques for solving problems by programming. Sorting, searching, linked lists, binary search trees, balanced trees, hashing. Prerequisite: CSE/ENGR 142 or equivalent knowledge of programming. For EE majors only.

CSE 410 Computer Systems (3)
Structure and components of hardware and software systems. Machine organization, including central processor and input-output architectures; assembly language programming; operating systems, including process, storage, and file management. Prerequisite: CSE 373. No credit if CSE 378 or CSE 451 has been taken.

CSE 413 Programming Languages and Their Implementation (3)
Concepts and implementation strategies for Algol-class languages, including Pascal, Modula, Algol 60, Ada. Compilers for Algol-class languages. Languages with late binding times, including Lisp, APL, Smalltalk. Prerequisite CSE 373. No credit if CSE 341 or CSE 401 has been taken.

CSE 415 Introduction to Artificial Intelligence (5)
Principles and programming techniques of artificial intelligence: Lisp, symbol manipulation knowledge representation, logical and probabilistic reasoning, learning, language understanding, vision, expert systems, and social issues. Prerequisites: CSE 373, or CSE 143 and permission of instructor. No credit if CSE 473 has been taken.

CSE 211 (which is no longer offered) may be used in place of CSE 143 as a prerequisite. CSE 210 may be used in place of CSE 142.

6 Computer Science and Engineering Courses for Majors

The curriculum is subject to change, since it is regularly updated to reflect a rapidly changing field.

CSE 321 Discrete Structures (4)
Fundamentals of set theory, graph theory, enumeration, and algebraic structures, with applications in computing. Prerequisite: Math 126 and CSE 143.

CSE 322 Introduction to Formal Models in Computer Science (3)
Finite automata and regular expressions; context free grammars and pushdown automata; non-determinism; Turing machines and the halting problem. Emphasis on understanding models and their applications and on rigorous use of basic techniques of analysis. Induction proofs, simulation, diagonalization and reduction arguments. Prerequisites: CSE 321.

CSE 320 Data Structures (4)
CSE 341 Programming Languages (5)
Designed to make the student reasonably fluent in several radically different languages, such as Lisp, Prolog, and Smalltalk. Prerequisite: CSE 143. No credit if CSE 413 has been taken.

CSE 370 Introduction to Digital Design (4)
Introductory course in digital logic and its specification, simulation, and testing. Boolean algebra, combinational and sequential digital circuits including arithmetic circuits and programmable logic devices. Laboratory sessions, three hours per week, to design, simulate, construct, and debug circuits based on concepts presented in lectures. Prerequisite: 321 or permission of instructor.

CSE 378 Machine Organization and Assembly Language (4)
Difference and similarities in machine organization; central processors; fundamentals of machine language and addressing: assembly language programming, including macros; operating system interfaces. Prerequisite: CSE 143. No credit if CSE 410 has been taken.

CSE 401 Introduction to Compiler Construction (3)
Fundamentals of compilers and interpreters; symbol tables, lexical analysis, syntax analysis, semantic analysis, code generation, and optimization for general purpose programming languages. Prerequisites: CSE 326, CSE 341, and CSE 378. No credit if CSE 413 has been taken.

CSE 403 Software Engineering (4)
This course presents the fundamentals of software engineering using a group project as the basic vehicle. Topics covered include the software crisis, managing complexity, requirements specification, architectural and detailed design, testing and analysis, software process, and tools and environments. Prerequisites: CSE 321, CSE 341, CSE 378. Either CSE 401 or CSE 451 is recommended.

CSE 421 Introduction to Algorithms (3)
Techniques for design of efficient algorithms. Methods for showing lower bounds on computational complexity. Particular algorithms for sorting, searching, set-manipulation, arithmetic, graph problems, pattern-matching, etc. Prerequisites: CSE 322 and CSE 326.

CSE 431 Introduction to Theory of Computation (3)
Models of computation, computable and non-computable functions, space and time complexity, tractable and intractable functions. Prerequisite: CSE 322.

CSE 440 Computer Based Simulation (3)
Computer based simulation is a valuable tool with wide varying application. In this course, Monte Carlo, continuous time, and discrete event simulations are presented. The design of appropriate simulation experiments and the interpretation of their results is considered. Students will implement simulations using Pascal, DYNAMO, and GPSS. Prerequisite: CSE 326. Some familiarity with probability and/or statistics may be helpful.

CSE 444 Introduction to Database Systems (3)
Fundamental concepts, system organization and implementation of database systems will be covered. Topics include the relational, hierarchical and network data models, file organizations and data structures, query languages, query optimization, database design, concurrency control, security, and issues involving distributed database systems. Prerequisite: CSE 326.

CSE 451 Introduction to Operating Systems (4)
Principles of operating systems. Process management, memory management, auxiliary storage management, resource allocation. Prerequisites: CSE 326 and CSE 378. No credit if CSE 410 or EE 474 has been taken.

CSE 457 Computer Graphics (3)
Techniques of computer image synthesis, including both hardware and software. Line drawing and color raster graphics; geometric transformations, hidden surface and smooth shading algorithms. Prerequisite: CSE 326.

CSE 481 Introduction to Computer-Communication Networks (3)

CSE 470 Computer Design (4)
Fundamental gating circuits are developed into large logic gating structures. The use of these structures in the design of central processing units, memories, and peripheral equipment is illustrated. Prerequisite: CSE 378.

CSE 471 Computer Design and Organization (4)
CPU instruction addressing models, CPU structure and functions, computer arithmetic and logic unit, register transfer level design, hardware and microprogram control, memory hierarchy design and organization, I/O and system components interconnection. Laboratory project involves design and simulation of an instruction set processor. Prerequisite: CSE 370 and CSE 378.

CSE/Ling 473 Introduction to Computational Linguistics (3)
Introduction to computer applications of linguistic theory, including syntactic processing, semantic, and pragmatic interpretation and natural language generation. Prerequisite: Ling 471, or permission of instructor.

CSE 473 Introduction to Artificial Intelligence (3)
Principal ideas and developments in artificial intelligence: theorem proving, problem-solving methods: representation of knowledge, natural language analysis and synthesis, programming languages for artificial intelligence. Prerequisites: CSE 326, CSE 341 recommended.

CSE 477 Digital System Design (5)
Students use the laboratory to design, simulate, construct, and debug a substantial project of their choosing. Lectures focus on issues in composing large digital systems ranging from memory subsystems and interface logic to communication protocols and controllers. Prerequisite: CSE 370 and assembly language programming.

CSE 480 Special Topics in Computer Science & Engineering (3)
Lectures and discussions on topics of current interest in computer science and engineering not covered by other CSE undergraduate courses.
CSE 498, 498II Senior Project (1-6) Honors (9)
Consists of a report (and perhaps demonstration) describing a development, survey, or small research project completed by the student in an area of specialization. Objectives are: (1) applying and integrating the classroom material from several courses, (2) introducing the professional literature, (3) gaining experience in writing a technical document, and (4) enhancing employability through the evidence of independent work. The project may cover an area in computer science and engineering or an application to another field. The work normally extends over more than one quarter. Prerequisite: Senior standing and permission of instructor.

CSE 499 Reading and Research (1-24)
Available in special situations for advanced Computer Science majors to do reading and research in the field. Subject to approval of the undergraduate advisor and a Computer Science and Engineering faculty member. Usable as a free elective, but not in place of a core course or Computer Science elective. Prerequisite: Senior standing and permission of instructor. Credit/no credit.
CSE 211 (which is no longer offered) may be used in place of CSE 143 as a prerequisite for any course.
The Department of Computer Science and Engineering offers a wide range of advanced, graduate level courses. Computer Science undergraduate majors may petition for entry to these courses, which are listed in the Computer Science Graduate Handbook and the University General Catalog.

7 Computer Science and Engineering Faculty


Jean-Loup Baer, Professor and Chair, Adjunct Professor of Electrical Engineering (1969). Diplome d'ingenieur, 1960, Doctorat 3e Cycle, 1963, Grenoble; Ph.D., 1968, UCLA. Parallel processing, system architecture.


Tony DeRose, Associate Professor (1985). B.S., 1981, UC Davis; Ph.D., 1985, UC Berkeley. Computer aided geometric design and modeling, graphical user interfaces, high resolution computer graphics.


Theodore H. Kehl, Professor, Professor of Physiology and Biophysics, DECwest Professor of Computer Design (1961). B.S., 1956, M.S. 1958, Ph.D., 1961, Wisconsin. Real-time hardware and software systems, computer design, VLSI.


8 Instructions for Application to the Computer Science Undergraduate Program

All information must be in the Computer Science Office by the deadline date, which is as follows:

- Autumn Quarter July 1
- Spring Quarter January 15

The packet must include:

1. Application with all sections completed.
   (a) University of Washington students obtain University of Washington transcript from Transcripts Office, 260 Schmitz, 543-5940.

   (b) Arts and Sciences pre-majors obtain transcripts from Central Advising Office, B10 Padelford.

   (c) If current grades are not on transcript, attach copies of grade sheets.

   (d) Copies of Complete transcripts from all Universities/Colleges attended.


3. Statement:
   (a) About 200 words, neatly presented.
   (b) Describe career goals, related work experience, and special circumstances not evident from the transcripts.

   Allow several weeks if an official transcript is being mailed.

   Admission to Computer Science does not constitute admission to the University of Washington. Admission to Computer Science is contingent upon acceptance to the University of Washington.

   Under no circumstances whatsoever will students who are admitted be permitted to delay their entrance to the program. Students not entering on schedule will be required to reapply to the program and are not guaranteed to be accepted again. You are responsible for knowing the requirements in effect at the time of application.

   The University of Washington, as a standing policy, does not discriminate against individuals because of their race, color, religion, age, sex, national origin, handicap, or status as a disabled veteran or Vietnam era veteran. Any discriminatory action can be a cause for disciplinary action.

   This policy applies to all University programs and facilities including, but not limited to, admissions, educational programs, and employment. Such discrimination is prohibited by Titles VI and VII of the Civil Rights Act of 1964, Title IX of the Education Amendments of 1972, Sections 503 and 504 of the Rehabilitation Act of 1973, Age Discrimination in Employment Act Amendments of 1978, Vietnam Era Veterans' Readjustment Assistance Act of 1974, and other federal and state statutes and regulations. Coordination of the compliance efforts of the University of Washington with respect to all of these laws and regulations is under the direction of the Equal Employment Officer, Dr. Phillip W. Cartwright, 140 Administration, AF-16, Seattle, Washington 98195, (206) 543-7630.