UNDERGRADUATE HANDBOOK
FOR COMPUTER SCIENCE

Department of Computer Science
University of Washington
114 Sieg Hall, FR-35
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(206) 543-1695
Introduction

The Department of Computer Science evolved from the Computer Science Group, a graduate interdisciplinary group that has offered M.S. and Ph.D. degrees since 1967. Since 1975, the department has offered an undergraduate degree program in which students can pursue a Bachelor of Science Degree under the College of Arts and Sciences.

Computer science is the study of information and algorithms within the context of real and abstract computing devices. Computer scientists are interested in: the representation and storage of information; algorithms to access, display, edit and transform information; programming and mathematical languages to express algorithms; and hardware and software processors to execute algorithms. These concerns lead both to theoretical investigations of computers, algorithms, and data and to practical developments in computer technology and applications.

The department currently offers undergraduate courses in programming, discrete structures, data structures, machine organization, computer design, operating systems, programming languages, compilers, artificial intelligence, design and analysis of algorithms, and theory of computation. The department also requires its majors to take courses in mathematics, physics and electronics.

The objective of Computer Science education is to develop professionally competent and broadly educated computer scientists. Undergraduate education is designed to prepare students for professional careers or graduate study; especially important is a foundation that will not become obsolete as technology advances and changes.

The computer field has a broad base of industrial and governmental users, providing many of the jobs suitable for the B.S. graduate. Typical jobs are systems analyst, systems programmer or software specialist. Above this base is a pyramid of producers and developers of computer systems, as well as teachers and researchers. Graduate education is appropriate for many of the jobs at these higher levels.

Admissions Procedure

Pre-Selection Requirements
A student may apply to enter the Computer Science program provided:

1. The following courses or equivalent have been completed:
   - Math 124, 125, 126
   - Physics 121, 122, 123
   - CSci 201
   OR
   - Math 124, 125, 126
   - Physics 121, 122, 123
   - CSci 210, 211

2. The student has completed at least 45 credit hours applicable to University graduation requirements.

3. The student has an overall University grade point average of at least 3.0

4. The student has been admitted to the University or has completed an application to the University through the Office of Admissions.

Application Information
The following must be submitted by the deadline date:

1. An application form (available in 114 Sieg Hall).

2. A typed statement of purpose, about 200 words long. Describe career goals and how a computer science degree would help fulfill these goals. Also, describe specific circumstances not reflected on your transcript that will help the department interpret your record (e.g., work experience, illness during an academic quarter, part-time work during an academic quarter, etc.)

3. Copies of complete transcripts from all universities and colleges you have attended.

Application Deadline Dates
The application deadlines are currently under revision. Check with the Computer Science office for a schedule of application deadlines.

Selection Process
The Computer Science Undergraduate Admissions Committee meets shortly after application deadlines to select students for admission. Selection is made primarily on the basis of scholastic achievement and potential. Other selection criteria, such as related work experience and grades in Computer Science preparatory courses and in all mathematics, science and engineering courses is also considered. Applicants are notified of their admission or denial by letter 3-3 weeks after the above deadlines. Students who are denied admission may discuss their application by meeting with the undergraduate advisor. An appointment can be made with the receptionist in 114 Sieg Hall.

Admission Policy
Objectives and Justification for an Admission Policy: Enrollment is limited due to space, faculty, and budgetary limitations. Those applicants who, in the judgement of the admissions committee, are most likely to succeed in the program and contribute to the field will be admitted.
Requirements for a Degree of Bachelor of Science

There are three components: (180 credits total)

1. GENERAL EDUCATION COMPONENT:
   - Includes 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.

PREPARATORY COMPONENT: (30 credits)
- Physics (12 credits): Physics 121, 122, 123
- Math (24 credits): Math 124, 125, 126; choose 3 courses from the following: Math 238, 259, 301, 302, 303, 305, any of the math courses in the senior elective component, Stat 301;

2. 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 (29 credits): Majors must take ALL of these classes: CSci 210, 211, 321, 322, 356, 341, 378. (CSci 201, 241 can be substituted for CSci 210, 211.)
   - Outer Core Component (12 credits): Majors must select at least 12 credits of these classes: CSci 401, 421, 431, 451, 470, 473.
   - Senior Elective Component (10 credits): Majors must select at least 10 credits from the following courses:
     a. CSci courses from the Outer Core Component not used to satisfy the Outer Core,
     b. Up to 6 credits of CSci 498 Senior Project (Honors students must take 9 credits),
     c. Any other 400-level CSci course, or
     d. Courses chosen from the Senior Elective Course list.

Approved Computer Science Senior Electives

Majors must choose a minimum of 10 credits from this list, see page 4.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tr>
<td>CSci 440</td>
<td>Computer-Based Simulation Models (4) in 84-86 catalog</td>
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<tr>
<td>CSci 444</td>
<td>Introduction to Database Systems (3)</td>
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<tr>
<td>Elec Engr: 417, 418</td>
<td>Introductory Communication Theory - (4,3)</td>
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<tr>
<td>471</td>
<td>Computer Architecture and Structure - (3)</td>
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<td>475</td>
<td>Digital Electronics and Microprocessors - (4)</td>
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<td>476</td>
<td>Logical Design of Digital Devices - (3)</td>
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<td>478</td>
<td>Design of Computer Subsystems - (4)</td>
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<td>479</td>
<td>Microcomputer System Design - (3)</td>
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<tr>
<td>Geog: 365</td>
<td>Introduction to Computer Cartography - (5)</td>
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<tr>
<td>463</td>
<td>Microcomputer Processing of Geographic Databases - (5)</td>
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<td>Computer Cartographics - (5)</td>
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<td>Ling: 461, 462</td>
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<td>Math: 402, 403, 404</td>
<td>Introduction to Modern Algebra - (3,3,3)</td>
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<td>405</td>
<td>Introduction to Mathematical Statistics - (3)</td>
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<td>406</td>
<td>Elementary Set Theory (3)</td>
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<td>Mathematical Optimization Theory - (3,3)</td>
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<td>414, 415</td>
<td>Number Theory - (3,3)</td>
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<td>461, 462</td>
<td>Combinatorial Theory (3)</td>
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<td>464, 465, 466</td>
<td>Numerical Analysis I, II, III - (3,3,3)</td>
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<td>Mech Engr: 477</td>
<td>Real-Time Microcomputer Applications in Mech Engr (4)</td>
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<td>Physics: 434</td>
<td>Application of Computers to Physical Measurement (3)</td>
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<tr>
<td>Quant Meth: 470, 472</td>
<td>System Design and Development I, II - (4,4)</td>
</tr>
<tr>
<td>Quant Sci: 381</td>
<td>Introduction to Probability &amp; Statistics (5) Quantitative Sci 381</td>
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<td>OR Stat 350 OR Stat 341 and 342 may be used as a CSci Elective.</td>
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<tr>
<td>Stat/Econ: 481</td>
<td>Introduction to Mathematical Statistics - (5)</td>
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<td>Statistics: 341, 342</td>
<td>Introduction to Probability and Statistical 390</td>
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<tr>
<td>Inference I, II (4,4)</td>
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<td>Probability and Statistics in Engineering and Science (4)</td>
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<td>394, 395, 396</td>
<td>Probability I, II, III (3,3,3)</td>
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<tr>
<td>421</td>
<td>Introduction to Applied Statistics and Experimental Design (4)</td>
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<tr>
<td>Stat/Math: 491, 492</td>
<td>Introduction to Stochastic Processes (3,3)</td>
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It is recommended, but not required, that students augment their computer science major with concentrated work in some application area like Physics, Mathematics, Economics, or Electrical Engineering. The reason for this recommendation is that, although computers are worth studying in themselves, they are also useful as tools to other disciplines. 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 and probability and statistics.
Computer Science Course Schedule

Course schedule will be changing for 1985-86

CSci 210, 211 Computer Science I, II (5.5) AW, WS, WS
Integrated two-quarter introduction to computer science. Emphasis on four areas: (1) introductory programming in a serious discipline; (2) elementary data structures and algorithms; (3) reasoning about the correctness and efficiency of programs; and (4) the structure of computer systems. A modern programming language, such as Modula-2, is introduced and used. Prerequisite: Math 124 for 210, 210 for 211.

CSci 221 Discrete Structures (3) AW
Fundamentals of set theory, graph theory, enumeration, and algebraic structures, with applications in computing. Prerequisite: MATH 126 and CSci 211. CSci majors only.

CSci 322 Introduction to Formal Models in Computer Science (3) ASp
Finite automata and regular expressions; context free grammars and pushdown automata; nondeterminism; 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: CSci 321. CSci majors only.

CSci 326 Data Structures (5) WS

CSci 341 Programming Languages (5) ASp
Designed to make the student reasonably fluent in several radically different languages, such as LISP, SNOBOL, APL, Simula, and others. Prerequisite: CSci 321. CSci majors only.

CSci 373 Data Structures and Algorithms (3) AW
Fundamentals of data 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, multitype trees). Garbage collection, memory management. Internal and external sorting. Prerequisite: CSci 211. For non-CSci majors only. No credit if CSci 326 or EE 374 have been taken.

CSci 378 Machine Organization and Assembly Language (5) AW
Difference and similarities in machine organization; central processors; fundamentals of machine language and addressing; assembly language programming, including macros; operating system interfaces. Prerequisite: CSci 211. No credit if EE 371 has been taken. CSci majors only.

CSci 401 Introduction to Compiler Construction (5) W
Fundamentals of compilers and interpreters; symbol tables, lexical analysis, syntax analysis, semantic analysis, code generation, and optimization for general purpose programming languages. Offered jointly with EE 401. Prerequisites: CSci 326 and 378. CSci majors only.

CSci 421 Introduction to the Analysis of Algorithms (3) Sp
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: CSci 322 and 326. CSci majors only.

CSci 431 Introduction, Theory of Computation (3) W (Offered Alternate Years)
Models of computation, computable and non-computable functions, space and time complexity, tractable and intractable functions. Prerequisite: CSci 322. CSci majors only.

CSci 440 Computer Based Simulation (4) W
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: CSci 211 and 373 or equivalent. Some familiarity with probability and/or statistics may be helpful.

CSci 444 Introduction to Database Systems (3) (New course, offered first time Winter 1985)
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. Prerequisites: CSci 326. CSci majors only.

CSci 451 Introduction to Operating Systems (3) A
Principles of operating systems. Process management, memory management, auxiliary storage management, resource allocation. Prerequisites: CSci 326 and 378. No credit if EE 474 has been taken. CSci majors only.

CSci 470 Computer Design (4) AW
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: CSci 378. CSci majors only.

CSci 473 Introduction to Artificial Intelligence (3) Sp
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: CSci 326. CSci is 341 recommended. CSci majors only.

CSci 498-, 498H- Senior Project (1-6 max. 6; Honors 1-9, max. 9) AW, Sp
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 or an application to another field. The work normally extends over more than one quarter. Prerequisite: senior standing. For Computer Science majors only. Entry cards required.
CSci 499 Reading and Research (1-24) A/WSpSu
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 faculty member.
Usable as a free elective, but not in place of a core course or Computer Science elective. Entry cards are required. Prerequisite: senior standing. Cr/No Cr only.

The Computer Science Department also offers a large number of advanced, graduate level courses.
The Computer Science undergraduate majors may petition for entry to these. A list of graduate
courses is contained in the Computer Science Graduate Handbook (available in 114 Sieg Hall) and the
University General Catalog.

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. A handout describing the Computer Science
Honors Program is available in 114 Sieg.

If You are a Non-Computer Science Major, Instructions are Listed Below on How
to Petition Courses Restricted to Computer Science Majors
We are forced by limited resources to restrict the enrollment in almost all our courses to undergraduate majors only. Other students who meet the following requirements can petition for entry cards:

- all prerequisites have been satisfied for entry into our undergraduate program, and
- all prerequisites have been satisfied for the specific course, and
- the student will be applying to our undergraduate major program during the quarter for which the petition is being filed, or either the course is listed as an approved elective for the student's home department, or the student is a US or graduate student from another department.

All graduate courses are for Computer Science graduate students only. Other students can petition for entry cards. Among the criteria that will be applied in judging petitions are the student's general academic background, specific preparation for the course and the importance of the course to the student's program.

Petition forms are available in 114 Sieg Hall.

COMPUTER SCIENCE FACULTY


Jean-Loup Baer, Professor of Computer Science and Adjunct Professor of Electrical Engineering (1969). Diplomes d' Ingenieur, 1960, Doctoral 3e Cycle, 1963, Grenoble; Ph.D., 1968, UCLA. Parallel processing, system architecture, data structures.


Alan Buring, Assistant Professor of Computer Science (1980). B.S., 1971, Reed; M.S., 1974, Ph.D., 1979, Stanford. Artificial intelligence, programming languages and environments.


Hellmut Golle, Professor of Computer Science and Adjunct Professor of Electrical Engineering (1959). Dipl.-Ing., 1955, Technische Hochschule Munich; M.S., 1955, Ph.D., 1959, Stanford. Programming languages, programming systems, compilers.


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


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