Computer Science Program

The Computer Science Program offers a bachelor’s of science degree in Computer Science, as well as a minor in Computer Science.

The goal of the Computer Science program at Idaho State University is to provide students with a broad, yet rigorous Computer Science education, with emphasis in:

- operating systems
- computer organization and architecture
- data structures and algorithms
- software implementation
- programming languages
- networks
- project management

The curriculum incorporates 30 credit hours of math and science including:

- differential and integral calculus
- linear algebra
- discrete math
- statistics

The B.S. in Computer Science prepares graduates to enter a wide range of high-paying careers, including:

- software engineering
- graphics
- databases
- cyber security

Seventy percent (70%) of the new STEM jobs over the next decade are expected to be CS related. National starting salaries are around $65,000 with career salaries averaging $147,000 (Robert Half 2017). CS majors with MBAs in technical management positions may earn significantly more.

Students wishing to become computer science majors should contact the CS office to have an advisor assigned to them. All courses and prerequisites applying toward the Computer Science major and minor must be passed with a grade of “C-” or higher.

For all CS courses after CS 1181, students are expected to have a laptop computer with sufficient capacity to run various tools within virtual machines.

Faculty

Program Director and Professor


Chair and Professor

Parker, Kevin R.,* Department Chair and Professor, Informatics. B.A. 1982, University of Texas at Austin; M.S. 1991, Ph.D. 1995, Texas Tech University. (1999)

Professor

Schou, Corey D.,* Associate Dean for Information Assurance and Professor, College of Business; Director, Informatics Research Institute. B.S. 1968, Rollins College; M.S. 1970, Ph.D. 1972, Florida State University. (1985)

Assistant Professors


Clinical Assistant Professor


Bachelor of Science in Computer Science

The following courses are required in addition to the university’s General Education Requirements (http://coursecat.isu.edu/previouscatalogs/2018-19/undergraduate/academicinformation/generaleducation) for the Bachelor of Science degree. 120 credits are required to graduate.¹

Mathematics and Science Courses:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 1170</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>MATH 1175</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>MATH 2275</td>
<td>Calculus III</td>
<td>4</td>
</tr>
<tr>
<td>MATH 2240</td>
<td>Linear Algebra</td>
<td>3</td>
</tr>
</tbody>
</table>

Select one course from each pair or triple:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS/MATH 1187 or MATH 2287</td>
<td>Applied Discrete Structures or Foundations of Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 2211</td>
<td>Engineering Physics I</td>
<td>3-4</td>
</tr>
<tr>
<td>or MATH 3360</td>
<td>Differential Equations</td>
<td></td>
</tr>
<tr>
<td>MATH 3350</td>
<td>Statistical Methods</td>
<td>3</td>
</tr>
<tr>
<td>or MATH 4450</td>
<td>Mathematical Statistics I</td>
<td></td>
</tr>
<tr>
<td>or MGT 2216</td>
<td>Business Statistics</td>
<td></td>
</tr>
<tr>
<td>MATH 3352</td>
<td>Introduction to Probability</td>
<td>3</td>
</tr>
<tr>
<td>or MGT 2217</td>
<td>Advanced Business Statistics</td>
<td></td>
</tr>
</tbody>
</table>

Required Computer Science and Related Courses:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFO 1150</td>
<td>Software and Systems Architecture</td>
<td>3</td>
</tr>
<tr>
<td>CS/INFO 1181</td>
<td>Computer Science and Programming I</td>
<td>3</td>
</tr>
<tr>
<td>or INFO 1182</td>
<td>Informatics and Programming II</td>
<td></td>
</tr>
<tr>
<td>CS 2275</td>
<td>Systems Programming and Assembly</td>
<td>3</td>
</tr>
<tr>
<td>CS 3308</td>
<td>Data Structures and Programming</td>
<td>3</td>
</tr>
<tr>
<td>INFO 3380</td>
<td>Networking and Virtualization</td>
<td>3</td>
</tr>
<tr>
<td>CS 3385</td>
<td>Data Structures and Algorithms</td>
<td>3</td>
</tr>
<tr>
<td>INFO 4411</td>
<td>Intermediate Information Assurance</td>
<td>3</td>
</tr>
<tr>
<td>CS 4471</td>
<td>Operating Systems</td>
<td>4</td>
</tr>
<tr>
<td>CS 4481</td>
<td>Compilers</td>
<td>3</td>
</tr>
</tbody>
</table>

¹ For all CS courses after CS 1181, students are expected to have a laptop computer with sufficient capacity to run various tools within virtual machines.
### Computer Science Program - Computer Science Program

**Minor in Computer Science**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 1170</td>
<td>Calculus I</td>
<td>3-4</td>
</tr>
<tr>
<td>or MGT 2217</td>
<td>Advanced Business Statistics</td>
<td></td>
</tr>
<tr>
<td>INFO 1150</td>
<td>Software and Systems Architecture</td>
<td>3</td>
</tr>
<tr>
<td>CS/INFO 1181</td>
<td>Computer Science and Programming I (Satisfies GE Objective 7)</td>
<td>3</td>
</tr>
<tr>
<td>CS 1182</td>
<td>Computer Science and Programming II</td>
<td>3</td>
</tr>
<tr>
<td>or INFO 1182</td>
<td>Informatics and Programming II</td>
<td></td>
</tr>
<tr>
<td>CS 2275</td>
<td>Systems Programming and Assembly</td>
<td>3</td>
</tr>
<tr>
<td>CS 3308</td>
<td>Data Structures and Programming</td>
<td>3</td>
</tr>
<tr>
<td>Approved Electives</td>
<td></td>
<td>6</td>
</tr>
</tbody>
</table>

Total Credits: 24-25

1. All required courses for the CS major and minor must be completed with a grade of C- or higher.

### Courses

**CS 1181 Computer Science and Programming I: 3 semester hours.**
Problem solving methods and algorithm development with an emphasis on programming style. Secure software design/coding concepts for resilient software. Equivalent to INFO 1181. Satisfies Objective 7 of the General Education Requirements. PRE-or-COREQ: MATH 1143 or MATH 1147. F, S

**CS 1182 Computer Science and Programming II: 3 semester hours.**

**CS 1187 Applied Discrete Structures: 3 semester hours.**
Discrete structures in CS and EE. Boolean algebra and logic; sets, functions, and relations; iteration, recursion, and induction; algorithms; programming in pseudocode; basic counting principles; graphs and trees; and other selected topics from discrete mathematics. Equivalent to MATH 1187. PREREQ: CS 1181/INFO 1181. S

**CS 2263 Advanced Object-Oriented Programming: 3 semester hours.**
Advanced programming in a modern object-oriented language, different from the one used in CS 1181 and CS 1182; philosophy, application, and examples of object-oriented concepts and techniques; comprehensive survey of software engineering design patterns. PREREQ: CS 1182. D

**CS 2275 Systems Programming and Assembly: 3 semester hours.**
Effect of computer architecture on the performance and correctness of code including data representation, machine language, compilation, code optimization, memory hierarchy, linking, pipelining, virtual memory, I/O and storage, and operating systems. Assembly programming. PRE-or-COREQ: INFO 1150, CS 1182 or INFO 1182. PREREQ: MATH 1143 or MATH 1144 or MATH 1147 or MATH 1170 or equivalent. D

**CS 2299 Experimental Course: 1-6 semester hours.**
This is an experimental course. The course title and number of credits are announced in the class schedule by the scheduling department. Experimental courses may be offered no more than three times with the same title and content.

**CS 3308 Data Structures and Programming: 3 semester hours.**
Introduction to data structures and their associated algorithms. Abstract data types, linked lists, stacks, queues, trees, Pointers. Sorting and searching. Elementary threading. Extensive programming exercises and projects. PREREQ: CS 1182 or INFO 1182 and MATH 1143 or MATH 1144 or MATH 1147 or MATH 1170 or equivalent. D

**CS 3321 Software Engineering: 3 semester hours.**
Techniques and tools for conceiving, designing, testing, deploying, maintaining, and documenting large software systems with particular focus on the structured analysis and design phases including task analysis, human factors, costs, and project and team management. PREREQ: CS 3308. D

**CS 3344 Artificial Intelligence: 3 semester hours.**
Fundamental principles and techniques of artificial intelligence systems; search strategies; knowledge acquisition and representation; common sense reasoning; planning; machine learning; expert systems; intelligent agents and multi-agent systems. PREREQ: CS 3385. D

**CS 3385 Data Structures and Algorithms: 3 semester hours.**
The design, construction, and analysis of data structures, algorithms, and complexity beyond CS 3308. Balanced trees, heaps, hash tables, graph algorithms, sorting and searching. Space and time complexity. Significant coding projects. PREREQ: CS 2275, CS 3308, MATH 1175, and MATH 2240. PRE-or-COREQ: MATH 1187 or MATH 2287. D
CS 3386 Data Structures and Algorithms II: 3 semester hours.
Continuation of CS 3385. PREREQ: CS 3385. D

CS 3393 Computer Science Internship: 1-3 semester hours.
Internship program coordinated by Computer Science faculty providing
significant exposure to computer science issues and techniques. May not be used
to fulfill computer science major or minor requirements. PREREQ: INFO 3307,
INFO 4407, CS 3308, CS 2275, MATH 1175, ENGL 1102, and permission of
instructor. D

CS 4420 Computer Security and Cryptography: 3 semester hours.
Public key and private key cryptography, key distribution, cryptographic
protocols, requisite mathematics and selected topics in the development of
security and cryptography. PREREQ: CS 3385. D

CS 4440 Web Programming: 3 semester hours.
Server and client-side, secure, web-based database and related applications.
PREREQ: CS 3308, CS 2275. PRE-or-COREQ: INFO 4407 or CS 4451. D

CS 4442 GUI Development: 3 semester hours.
Planning and construction of Graphical User Interfaces and discussion of
essential software engineering concepts. Includes the use of a modern toolkit
language. PREREQ: CS 3385. D

CS 4444 Image and Audio Processing: 3 semester hours.
Image and audio acquisition, quantization, spatial and spectral filters, sharpening,
smoothing, restoration, compression, segmentation, Fourier and Wavelet
transforms. PREREQ: CS 1187/MATH 1187, MATH 3352, and MATH 3360. D

CS 4445 Data Compression: 3 semester hours.
A survey of modern techniques of data compression, both lossy and loss-less and
encryption. PREREQ: CS 3385. D

CS 4451 Database Theory Design and Programming: 3 semester hours.
Data models, relational algebra and calculus, SQL and stored procedures,
database design, ER diagrams, normalization theory, data storage, index
structures, performance analysis, concurrency control. Database programming
language access. Uses a different programming language. PREREQ: CS 3385. D

CS 4458 Computer Graphics: 3 semester hours.
Graphics, transformation matrices, lighting models, object hierarchies, visible
surface determination, ray tracing. PREREQ: CS 3385 and (CS 1187 or
MATH 1187 or MATH 2287). D

CS 4460 Comparative Programming Languages: 3 semester hours.
Design of historical and contemporary programming languages, concentration on
promoting understanding of structural organization, data structures and typing,
name structures, and control structures. PREREQ: CS 3385 and either CS 2275 or
CS 4475. D

CS 4470 Parallel Processing: 3 semester hours.
Topics in high-performance computing: parallel architectures, SIMD, MIND,
SMP, NUMA models, message passing, cache coherency issues, MPI, PVM,
parallel programming languages, cluster and grid approaches, applications and
experience programming on a cluster. PREREQ: CS 3385 and either CS 2275 or
CS 4475. D

CS 4471 Operating Systems: 4 semester hours.
Theory, design, and implementation of software systems to support the
management of computing resources. Concurrency, mutual exclusion and
synchronization, CPU scheduling, Process, memory, and security. I/O files,
and device management. Scripts and shells. Extensive systems programming
including implementation of a portion of an operating system. PREREQ:
CS 2275 and CS 3308. D

CS 4478 Advanced Software Engineering and Project: 3 semester hours.
Analysis, specification, design, implementation, and testing of a large software
project. Formal approach and tools. Software lifecycle. Human computer
interaction. Project and team management. Uses a different programming
language. PREREQ: CS 3385, CS 3321 or INFO 3307, and CS 4451 or
INFO 4407. D

CS 4481 Compilers: 3 semester hours.
Design and construction of compilers. Theory and pragmatics of lexical,
syntactic, and semantic analysis. Interpretation. Code generation for a modern
architecture. Run-time environments. Includes a large compiler-implementation
project. PREREQ: CS 3385. D

CS 4485 Theory of Computation: 3 semester hours.
Finite representations of languages, deterministic and nondeterministic finite
automata, context free languages, regular languages, parsing, Turing Machines,
Church’s Thesis, uncomputability, computational complexity classes. PREREQ:
CS 3385, CS 1187/MATH 1187 or MATH 2287, and MATH 1175. D

CS 4488 Theory of Computation: 3 semester hours.
Finite representations of languages, deterministic and nondeterministic finite
automata, context free languages, regular languages, parsing, Turing Machines,
Church’s Thesis, uncomputability, computational complexity classes. PREREQ:
CS 3385, CS 1187/MATH 1187 or MATH 2287, and MATH 1175. D

CS 4489 Experimental Course: 1-6 semester hours.
This is an experimental course. The course title and number of credits are
announced in the class schedule by the scheduling department. Experimental
courses may be offered no more than three times with the same title and content.