Computer Science (CS)

CS F101 Computers and Society (m)
3 Credits
Computer literacy for everyone. Overview of computing machines and automatic data processing. Interaction between social institutions and automated decision-making. Introduction to business applications software and electronic mail. Some programming for understanding, not for skill development.
Prerequisites: Two years of high school mathematics, including at least one year of algebra.
Lecture + Lab + Other: 3 + 0 + 0

CS F103 Introduction to Computer Programming
3 Credits
Programming for non-majors and for those computer science students without the background for CS F201. Concepts of object-oriented programming and algorithm design within the syntax of the JAVA programming language.
Prerequisites: Math placement at the 100-level.
Lecture + Lab + Other: 3 + 0 + 0

CS F201 Computer Science I
3 Credits
The discipline of computer science including problem solving, algorithm development, structured programming, top-down design, good programming style, object-oriented programming and elementary data structures. Concepts implemented with extensive programming experience in a structured language and with a group programming project.
Prerequisites: One year high school level programming or CS F103; mathematics placement at the F200-level.
Lecture + Lab + Other: 3 + 0 + 0

CS F202 Computer Science II
3 Credits
The discipline of computer science including problem solving, algorithm development, structured programming, top-down design, good programming style, object-oriented programming and elementary data structures. Concepts implemented with extensive programming experience in a structured language and with a group programming project.
Prerequisites: CS F201.
Lecture + Lab + Other: 3 + 0 + 0

CS F301 Assembly Language Programming
3 Credits
Offered Fall
Organization of computer registers, I/O and control. Digital representation of data. Symbolic coding, instructions, addressing modes, program segmentation, linkage, macros and subroutines.
Prerequisites: CS F201.
Lecture + Lab + Other: 3 + 0 + 0

CS F301 Data Structures and Algorithms
3 Credits
Offered Fall
Data structures and the algorithms for their manipulation. Algorithmic efficiency and asymptotic notation. Algorithms for searching and sorting. Abstract data types and container data structures: arrays, linked lists, stacks, queues, trees, tables, heaps, balanced search trees, hash tables.
Prerequisites: CS F202.
Lecture + Lab + Other: 3 + 0 + 0

CS F311 Operating Systems
3 Credits
Offered Spring
Functions of files and operating systems. Review of required architectural features. The PROCESS concept. Storage management, access methods and control, interrupt processing, scheduling algorithms, file organization and management, and resource accounting.
Prerequisites: CS F301.
Lecture + Lab + Other: 3 + 0 + 0

CS F331 Programming Languages
3 Credits
Offered Spring
Syntax and semantics of widely differing programming languages. Syntax specification, block structure, binding, data structures, operators and control structures. Comparison of several languages such as ALGOL, LISP, SNOBOL and APL.
Prerequisites: CS F311.
Lecture + Lab + Other: 3 + 0 + 0

CS F361 Systems Security and Administration
3 Credits
Offered Alternate Fall Odd-numbered Years
Advanced systems programming including privileged instructions and system services, authentication technologies, host-based and network-based security issues. Applications to asynchronous I/O, process control and communication, device drivers and file management.
Prerequisites: CS F301.
Lecture + Lab + Other: 3 + 0 + 0

CS F371 Computer Ethics and Technical Communication
3 Credits
Offered Fall
This course explores the social, legal and ethical issues aggravated, transformed or created by computer technology. Additional focus is on technical communication skills needed in the computer industry.
Prerequisites: WRTG F211X or WRTG F213X; COJO F131X or COJO F141X; CS F202.
Lecture + Lab + Other: 3 + 0 + 0

CS F372 Software Construction
3 Credits
Offered Spring
Methods for programming and construction of complete computer applications, including refactoring, performance measurement, process documentation, unit testing, version control, integrated development environments, debugging and debuggers, interpreting requirements, and design patterns.
Prerequisites: CS F311.
Lecture + Lab + Other: 3 + 0 + 0

CS F381 Computer Graphics
3 Credits
Offered Fall
Creation of computer-generated images on programmable 3-D graphics hardware. Color, lighting, textures, hidden surfaces, 3-D geometric transformations, curve and surface representations, 2-D and 3-D user interfaces, and the visual modeling of physical phenomena.
Prerequisites: CS F202; MATH F253X or MATH F314.
Lecture + Lab + Other: 3 + 0 + 0

CS F392 Seminar
1-6 Credits
Lecture + Lab + Other: 0 + 0 + 0
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<tr>
<th>Course Code</th>
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<th>Credits</th>
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<tbody>
<tr>
<td>CS F405</td>
<td>Introduction to Artificial Intelligence</td>
<td>3</td>
<td>Spring Even-numbered Years</td>
<td>CS F311 or permission of instructor.</td>
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<tr>
<td>CS F411</td>
<td>Analysis of Algorithms</td>
<td>3</td>
<td>Fall</td>
<td>MATH F307, CS F311.</td>
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<td>CS F421</td>
<td>Distributed Operating Systems (W)</td>
<td>3</td>
<td>Fall</td>
<td>CS F321; WRTG F111X; WRTG F211X or WRTG F213X; or permission of instructor.</td>
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<td>CS F425</td>
<td>Database Systems</td>
<td>3</td>
<td>Fall</td>
<td>CS F321; or permission of instructor.</td>
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<td>CS F431</td>
<td>Programming Language Implementation (W)</td>
<td>3</td>
<td>Spring Even-numbered Years</td>
<td>MATH F307; CS F311; or permission of instructor.</td>
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<td>CS F410</td>
<td>System Architecture</td>
<td>3</td>
<td>Spring</td>
<td>CS F321; EE F341.</td>
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<td>CS F460</td>
<td>Introduction to Digital Forensics</td>
<td>3</td>
<td>Odd-numbered Years</td>
<td>CS F361; or permission of instructor.</td>
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<td>CS F462</td>
<td>Intrusion Detection Systems</td>
<td>3</td>
<td>Fall</td>
<td>CS F321; or permission of instructor.</td>
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<td>CS F463</td>
<td>Cryptography and Data Security</td>
<td>3</td>
<td>Odd-numbered Years</td>
<td>CS F321; or permission of instructor.</td>
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<td>CS F471</td>
<td>Senior Capstone I (W)</td>
<td>3</td>
<td>Fall</td>
<td>CS major; senior standing; CS F311; CS F371.</td>
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CS F472  Senior Capstone II (O, W)  3 Credits  
Offered Spring  
Group projects in a real computer industry environment and produce appropriate documentation and reports. Nature, ethics, and legal considerations of the computer science profession are discussed with an emphasis on ethics. Additional topics include project management, design methodologies, technical presentation, human-machine interface and programming team interactions.  
Prerequisites: CS F372; CS F471.  
Lecture + Lab + Other: 3 + 0 + 0  
CS F480  Topics in Computer Science  3 Credits  
Offered As Demand Warrants  
Topics include, but are not limited to; computational linear algebra, cryptography, parallel algorithm development and analysis. Note: Course may be repeated when topics change.  
Lecture + Lab + Other: 0 + 3 + 0  
CS F481  Graphics Rendering  3 Credits  
Offered Spring Even-numbered Years  
High-quality rendering techniques used in computer graphics: raytracing, shadows, antialiasing, volume rendering, radiometry and radiosity. Also topics such as particle systems, shading, image processing, computer aided design, video effects, animation and virtual environments.  
Prerequisites: CS F381.  
Lecture + Lab + Other: 3 + 0 + 0  
CS F482  Simulations in Computer Graphics  3 Credits  
Offered Spring Odd-numbered Years  
Software to simulate physical phenomena for use in interactive visualization, such as particle systems, Naiver-Stokes fluid dynamics, and finite element solid mechanics. Includes Lagrangian and Eulerian meshes, stability, and discretization order. Our focus is high performance qualitatively correct simulations, rather than high precision solutions.  
Prerequisites: CS F381 and PHYS F212X.  
Lecture + Lab + Other: 3 + 0 + 0  
CS F605  Artificial Intelligence  3 Credits  
Offered Spring Even-numbered Years  
Prerequisites: Graduate standing or permission of CS graduate advisor.  
Lecture + Lab + Other: 3 + 0 + 0  
CS F611  Complexity of Algorithms  3 Credits  
Offered Fall  
Theoretical analysis of various algorithms: topics include sorting, searching, selection, polynomial evaluation, NP completeness, decidability.  
Prerequisites: CS F411.  
Lecture + Lab + Other: 3 + 0 + 0  
CS F621  Advanced Systems Programming  3 Credits  
Offered As Demand Warrants  
Multiprogramming and multiprocessing systems. File and program security. Scheduling optimization and system tuning. I/O processing, archiving and system recovery, and initialization. Study of current systems.  
Prerequisites: CS F311 and CS F321.  
Lecture + Lab + Other: 3 + 0 + 0  
CS F625  Database Systems Design  3 Credits  
Offered Fall  
The design and analysis of database systems including data independence, relationships, and organization. Focus on data models, file organization and security, index organization, data integrity and reliability. Review of current database software packages. Design and implementation of a database application project.  
Prerequisites: CS F311.  
Lecture + Lab + Other: 3 + 0 + 0  
CS F631  Programming Language Implementation  3 Credits  
Offered Fall  
Formal treatment of programming language translation and compiler design. Parsing context-free languages, translation specifications, machine independent code, NBF, scanners, symbol tables, parsers and recursive descent. Programming of compiler or interpreter segments as projects.  
Prerequisites: CS F331.  
Lecture + Lab + Other: 3 + 0 + 0  
CS F641  Advanced Systems Architecture  3 Credits  
Offered Spring  
A study of advanced single processor systems. Detailed study of multiprocessor architectures, such as vector architectures, massively parallel processors and shared-memory multi-processors.  
Prerequisites: CS F441 or permission of Computer Science graduate advisor.  
Lecture + Lab + Other: 3 + 0 + 0
CS F642  Advanced Computer Networks
3 Credits
Offered Fall
A study of networks of interacting computers. The problems, rationales and possible solutions for both distributed processing and distributed databases will be examined. Major national and international protocols will be presented.
Prerequisites: Graduate standing or permission of Computer Science graduate advisor.
Lecture + Lab + Other: 3 + 0 + 0

CS F671  Advanced Software Engineering
3 Credits
Offered Spring
Advanced software development as an engineering discipline. Includes investigation of current tools, standards, foundation and trends in software engineering from component-ware, software system composition, e-systems, software architecture and CASE tools.
Prerequisites: CS F471.
Lecture + Lab + Other: 3 + 0 + 0

CS F680  Topics in Computer Science
1-4 Credits
Offered As Demand Warrants
Example topics include, but are not limited to, software requirements engineering, cryptography, parallel algorithm development and analysis. May be repeated for credit with change of topic.
Prerequisites: Varies with each topic.
Recommended: Varies with each topic.
Lecture + Lab + Other: 1-4 + 0 + 0

CS F681  Topics in Computer Graphics
3 Credits
Offered Spring
Hardware, software and techniques used in computer graphics taken from topics such as refresh, storage, raster scan technology, volume rendering, particle systems, shading, image processing, computer aided design, video effects, animation and virtual environments.
Prerequisites: CS F481 and MATH F314.
Lecture + Lab + Other: 3 + 0 + 0

CS F690  Graduate Seminar and Project
1-6 Credits
Offered Fall
First semester of two-semester seminar in which students will, individually or in teams, work on and present the results of major programming or literature survey projects in computer science or software engineering. Written and oral reports will be required.
Prerequisites: 12 credits in graduate computer science or software engineering courses; or permission of Computer Science or Software Engineering graduate advisor.
Cross-listed with SWE F690.
Lecture + Lab + Other: 1-6 + 0 + 0

CS F691  Graduate Seminar and Project
3 Credits
Offered Spring
Second semester of a two-semester seminar in which students will, individually or in teams, work on and present the results of major programming or literature survey projects in computer science or software engineering. Written and oral reports will be required.
Prerequisites: CS F690; 12 credits in graduate computer science or software engineering courses; or permission of Computer Science or Software Engineering graduate advisor.
Lecture + Lab + Other: 3 + 0 + 0

CS F692  Seminar
1-6 Credits
Lecture + Lab + Other: 1-6 + 0 + 0

CS F698  Non-Thesis Research/Project
1-9 Credits
Lecture + Lab + Other: 0 + 0 + 0

CS F699  Thesis
1-9 Credits
Lecture + Lab + Other: 0 + 0 + 0