COMPUTER SCIENCE (CS)

CS F101  Computers and Society  (m)  
3 Credits  
Offered Fall, Spring and Summer  
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  
Offered Fall and Spring  
Computer programming for students without the background for CS F201. Concepts of object-oriented programming and algorithm design using the Java programming language.  
Prerequisites: Math placement at the 100-level.  
Lecture + Lab + Other: 3 + 0 + 0  

CS F180  Introduction to Programming and Algorithmic Thinking  
1 Credit  
Offered As Demand Warrants  
Introduction to fundamental concepts across different programming languages including: variables, looping, conditional statements, flow, maintainable code, searching and sorting algorithms. This course is designed as an advance layer over the materials and activities associated with the T3 Alliance grant funded program (T3.alliance.org).  
Lecture + Lab + Other: 1 + 0 + 0  

CS F201  Computer Science I  
3 Credits  
Offered Fall and Spring  
The discipline of computer science including problem solving, algorithm development, good programming style, control flow, I/O and elementary data structures. Concepts implemented with extensive programming experience in C++, and 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  
Offered Fall and Spring  
The discipline of computer science including classes, object-oriented programming, operators, RAII, inheritance, exceptions and generic programming with templates. Concepts implemented with extensive programming experience in C++ and a group programming project.  
Prerequisites: CS F201.  
Lecture + Lab + Other: 3 + 0 + 0  

CS F301  Assembly Language Programming  
3 Credits  
Offered Fall  
The low level structure of a modern computer: hardware instruction set architecture, registers, the call stack, pointers, the heap, the page table, and threads. Applications include performance and security.  
Prerequisites: CS F201.  
Lecture + Lab + Other: 3 + 0 + 0  

CS F311  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 F321  Operating Systems  
3 Credits  
Offered Spring  
The software stack in a modern computer: thread, process, container, kernel, hypervisor and network. Enforcing access control and securing communication between these layers, and designing services to use them effectively.  
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, lexical analysis, parsing and interpretation. Comparison of diverse languages such as Python, Haskell, Forth and Prolog.  
Prerequisites: CS F311.  
Lecture + Lab + Other: 3 + 0 + 0  

CS F361  Systems Security and Administration  
3 Credits  
Offered As Demand Warrants  
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, WRTG F212X, WRTG F213X or WRTG F214X; 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 F392  Seminar  
1-6 Credits  
Lecture + Lab + Other: 0 + 0 + 0
CS F405 Introduction to Artificial Intelligence  
3 Credits  
Offered Spring  
Examine diverse branches of AI placing AI in larger context of computer science and software engineering. Knowledge representation formalism and search technology. Programming methodologies; procedural systems such as expert systems and blackboard systems and non-procedural systems such as neural networks. Software engineering aspects of problem selection, knowledge acquisition, verification and validation. Individual projects.  
Prerequisites: CS F311.  
Lecture + Lab + Other: 3 + 0 + 0

CS F411 Analysis of Algorithms  
3 Credits  
Offered Fall  
Analysis of classic algorithms, their implementation and efficiency. Topics from combinatorics (sets, graphs), algebra (integer arithmetic, primes, polynomial arithmetic, GCD, Diophantine equations, encryption), systems (parsing searching, sorting) and theory (recursion, Turing machines). The complexity classes P, NP and NP complete.  
Prerequisites: MATH F307, CS F311.  
Lecture + Lab + Other: 3 + 0 + 0

CS F421 Distributed Operating Systems (W)  
3 Credits  
Offered As Demand Warrants  
Detailed level study of distributed operating system algorithms, functions and associated implementation. Distributed operating system tuning methods and security. Role of distributed operating systems in net-centric computing. Programming, documentation and evaluation of distributed operating system segments as projects.  
Prerequisites: CS F321; WRTG F111X; WRTG F211X, WRTG F212X, WRTG F213X or WRTG F214X.  
Lecture + Lab + Other: 3 + 0 + 0

CS F425 Database Systems  
3 Credits  
Offered Fall  
Data independence, modeling, relationships and organization. Hierarchical, network and relational data models; canonical schema. Data description languages, SQL, query facilities, functional dependencies, normalization, data integrity and reliability. Review of current database software packages.  
Prerequisites: CS F311; CS F321.  
Lecture + Lab + Other: 3 + 0 + 0

CS F441 System Architecture  
3 Credits  
Offered Spring  
Computer design fundamentals, performance and cost, pipelining, instruction-level parallelism, memory hierarchy design, storage systems, and vector processing.  
Prerequisites: CS F321, EE F341.  
Lecture + Lab + Other: 3 + 0 + 0

CS F442 Computer Communication and Networks  
3 Credits  
Offered As Demand Warrants  
Study of computer networks using the ISO/OSI layered model as a framework. Design issues and trade-offs, protocols and selected standards. Emphasis on ISO/OSI Layers 1-4/(Physical, Data Link, Network and Transport Layers), plus medium access sublayers (LAN’s, etc.).  
Prerequisites: CS F321.  
Lecture + Lab + Other: 3 + 0 + 0

CS F450 Introduction to Digital Forensics  
3 Credits  
Offered As Demand Warrants  
Takes a hands-on approach to the forensics examination of computer technology. Focuses on the forensic process, methods, and tools utilized to collect and preserve and examine digital evidence. Course topics include: collection, preservation and examination of evidence from computers including file systems, email and malicious code.  
Prerequisites: CS F321.  
Lecture + Lab + Other: 3 + 0 + 0

CS F462 Intrusion Detection Systems  
3 Credits  
Offered As Demand Warrants  
Focus on IDS theory and practice and its importance; the origin and resolution of common security threats and vulnerabilities; host and network approaches to IDS implementation; and the legal, ethical, and privacy issues associated with IDS use and policies.  
Prerequisites: CS F361.  
Lecture + Lab + Other: 3 + 0 + 0

CS F463 Cryptography and Data Security  
3 Credits  
Offered As Demand Warrants  
Specialized study of cryptography and its application in securing data systems, with an emphasis on applied cryptography. Topics include history of cryptography, encryption, digital signatures, authentication, electronic commerce, key distribution and management, private and public key cryptography, and protocols.  
Prerequisites: MATH F307, CS F311.  
Lecture + Lab + Other: 3 + 0 + 0

CS F471 Senior Capstone I (W)  
3 Credits  
Offered Fall  
Introduction to software engineering and project management principles, techniques, methods and standards for software system development. Additional topics include technical communication, computer ethics and legal issues.  
Prerequisites: CS major; senior standing; CS F311; CS F371.  
Lecture + Lab + Other: 3 + 0 + 0

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.  
Special Notes: Course may be repeated when topics change.  
Lecture + Lab + Other: 0 + 3 + 0

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CS F671  Advanced Software Engineering  
3 Credits  
Offered As Demand Warrants  
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 Fall  
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 F202 and MATH F253X.  
Lecture + Lab + Other: 3 + 0 + 0

CS F684  Computer Graphics Fundamentals  
3 Credits  
Offered Fall  
Prerequisites: CS F202; MATH F253X.  
Stacked with CS F484.  
Lecture + Lab + Other: 3 + 0 + 0

CS F685  Computer Graphics Rendering  
3 Credits  
Offered As Demand Warrants  
Designing graphics engines for realtime rendering of computer generated imagery; physically based approaches to shading and shadows; artistic approaches to shading and nonphotorealistic rendering; algorithms for rendering an image including ray tracing, deferred rendering, and global illumination; image space algorithms for simulation of camera effects.  
Prerequisites: CS F202; MATH F253X.  
Stacked with CS F485.  
Lecture + Lab + Other: 3 + 0 + 0

CS F686  Computer Graphics Animation and Simulation  
3 Credits  
Offered As Demand Warrants  
Creation of computer graphics animation and simulation of physically based phenomena; designing simulation systems for computer graphics applications; physically based phenomena using particle systems, fluid simulation, and rigid body dynamics; key frame animation, bones, and rigging; and other related topics.  
Prerequisites: CS F202 and PHYS F212X.  
Stacked with CS F486.  
Lecture + Lab + Other: 3 + 0 + 0

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

CS F691  Graduate Seminar and Project  
3 Credits  
Offered Spring  
Second semester of a two-semester seminar in which students will work on and present the results of major programming or literature survey projects in computer science. Written and oral reports will be required.  
Prerequisites: CS F690; 12 credits in graduate computer science courses; or permission of Computer Science 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