COMPUTER SCIENCE

Professors Anderson, Ardis, Kinley, Laxer, Mellor, Mutchler, Oexmann, Wollowski, and Young

CS 100  Introduction to Programming and Problem Solving  1R-3L-2C  W,S

An introduction to general methods of problem solving, structured algorithm design, and elementary computer programming.

CS 120  Fundamentals of Computing I  3R-3L-4C  F,W,S

Fundamental concepts of computer science, algorithms, problem solving, computer programming, procedural abstraction, control structures, elementary data structures, object-oriented programming, programming style, testing.

CS 220  Fundamentals of Computing II  3.5R-1.5L-4C  F,W,S (except F 2001)  Prerequisite: CS 120

Fundamental data structures. Lists, stacks, queues, trees, sorting and searching, space and time requirements, object oriented design, polymorphism and inheritance, introduction to software engineering methods. Team software design and implementation.


Complex data structures, e.g., graphs, heaps, advanced search trees. Data and algorithm invariants, analysis of time and space usage, formal methods, uses in software engineering.

CS 232  Computer Architecture I  3.5R-1.5L-4C  F,W  Prerequisites: CS 120 and EC130

Computer arithmetic including ALU design and floating point representation; instruction set architecture including historical perspectives and evolution (assembly language programming is used as a means of exploring instruction set architectures), single-cycle and multi-cycle data path, performance evaluation, and processor control. The final project involves the complete design and implementation of a miniscule instruction set processor.

CS 304  Programming Language Concepts  4R-0L-4C  F,S  Prerequisite: CS 230 (MA 315 recommended)

Syntax and semantics of programming languages, grammars, parsing, data types, data control, sequence control, run-time storage management, binding times, functional programming, object oriented languages, syntactic extensions, continuations, language design and evaluation. Students will explore several concepts by writing an interpreter that implements them.

CS 325  Fractals and Chaotic Dynamical Systems  4R-0L-4C  S  Prerequisites: CS 220, MA 222, either MA 223 or MA 381 (may be taken concurrently) or permission of instructor

Emphasis on the mathematical and computer graphics foundations behind fractal images and the relationship between chaotic dynamics and fractal geometry. Self-similar fractals, random fractals with Brownian motion, and fractals generated from dynamical systems. Fractal dimensions. Iterated

CS 331 UNIX Systems Programming 4R-0L-4C S Prerequisite: CS 220

Systems programming in the UNIX environment. Introduction to the UNIX environment. Review and extension of C programming. UNIX system calls: input/output, files and directories, processes and inter-process communication, sockets and inter-host communication. UNIX software tools: shells, filters, scripting languages. Students will complete an implementation project and will research and give a class presentation on an advanced topic.

CS 332 Operating Systems 4R-0L-4C F,S Prerequisites: CS 220 and CS 232

The evolution of modern operating systems, CPU scheduling, process synchronization, deadlocks, memory management, virtual memory, file systems, and I/O systems. Operating system design, performance evaluation, distributed systems, privacy, and security. Programming assignments are required.

CS 333 Introduction to Database Systems 4R-0L-4C S Prerequisite: CS 220

Introduction to relational database systems. B+ trees and indexing, raid, data modeling using Entity Relationship Diagrams and translation of models to relational tables. Normal forms, SQL, indexes, views, sequences, joins, triggers and stored procedures.

CS 351 Computer Graphics 4R-0L-4C F Prerequisites: CS 220 and MA 221

Computer graphics algorithms, hardware and software. Line generators, affine transformations, line and polygon clipping, interactive techniques, perspective projection, solid modeling, hidden surface algorithms, lighting models, shading, and graphics standards. Programming assignments and a final project are required.

CS 404 Compiler Construction 4R-0L-4C S Prerequisites: CS 232 and CS 304

Theory and practice of programming language translation. Lexical analysis, syntax analysis, parser generators, abstract syntax, symbol tables, code generation, code optimization, run-time storage management, compiler organization, intermediate languages, error handling. Course project is construction of a compiler for a small language.

CS 413 Artificial Intelligence 4R-0L-4C W Prerequisite: CS 220

Modeling and implementing intelligent behavior using computers. Heuristic and goal-directed search, game playing, rule-based systems, knowledge representation, machine learning, robotics. Discussion of current mainstream topics is encouraged. Students will be required to read from technical papers. Programming assignments completed using both Scheme and Java.

CS 414 Software Engineering I 4R-0L-4C W Prerequisite: CS 230 or permission of instructor

CS 415 Software Engineering II 4R-0L-4C S Prerequisite: CS 414

Tools and techniques used to design, develop, document, and maintain large software systems. Life-cycle models, feasibility studies, requirements analysis, system specification and design, design
methodologies, formal methods, system implementation, process management, user interfaces, quality assurance, testing, system installation and maintenance, CASE tools, system documentation, user manuals and on-line help, reference manuals, software engineering standards, legal and ethical issues. Extensive project work and documentation.

CS 432 Computer Networks 4R-0L-4C F Prerequisites: CS 220 and CS 232

Organization, design, and implementation of computer networks. Network protocols, protocol layering, flow control, error control, packet organization, routing, gateways, connection establishment and maintenance, machine and domain naming and location, electronic mail, file transfer and access, remote login and terminal emulation, network management, distributed network control.

CS 433 Advanced Database Systems 4R-0L-4C W Prerequisite: CS 333

Topics selected from object-oriented databases, object-relational databases, query processing, transactions, transaction logging, concurrency control, database recovery, parallel and distributed databases, security and integrity, data mining and data warehousing.

CS 441 Theory of Computation 4R-0L-4C F [2002-2001] Prerequisites: CS 230 and MA 315

Theoretical and mathematical issues in computer science. Automata, grammars, formal languages. Turing machines, the halting problem, undecidability, computability theory, recursive functions.

CS 445 Analysis of Algorithms 4R-0L-4C F [2001-2002] Prerequisites: CS 230 and MA 315

Analysis of space and time requirements of standard computational and combinatorial algorithms. Computational models, average case and worst case analysis, lower bounds for algorithms, provably optimal algorithms, computational complexity, NP-complete problems, provably intractable problems, probabilistic algorithms.

CS 451 Advanced Computer Graphics 4R-0L-4C W Prerequisite: CS 351

Advanced topics in computer graphics. Topics will be drawn from current graphics research and will vary, but generally will include ray tracing, radiosity, physically-based modeling, animation, and stereoscopic viewing. Programming assignments are required.

CS 453 Topics in Artificial Intelligence 4R-0L-4C S Prerequisite: CS 413

Advanced topics in artificial intelligence. Topics will vary. Past topics have included machine game playing and machine learning. May be repeated for credit if topic is different.

CS 490 Special Topics in Computer Science 4C Arr Prerequisite: Permission of instructor

Selected topics of current interest. May be repeated for credit if topic is different.

CS 491-2 Directed Independent Studies 4C Arr Prerequisite: Permission of instructor and department head

Independent study of an advanced subject not included in regularly offered courses.
CS 494 Undergraduate Research in Computer Science 1-4C Arr Prerequisite: Permission of instructor and department head

Research under direction of a faculty member. Presentation of preliminary and final results to departmental seminar. Presentation of work at professional meetings or by publication in professional journals is strongly encouraged. May be repeated for credit if topic or level is different.

CS 495 Senior Thesis I 4C F Prerequisite: Permission of department

CS 496 Senior Thesis II 4C W Prerequisite: CS 495

Individual study and research of a topic in computer science. Topic is expected to be at an advanced level. Research paper and presentation to department seminar are required. Credit for CS 496 is awarded after CS 495 has been completed.

CS 497 Senior Project I 4C F Prerequisite: CS 415

CS 498 Senior Project II 4C W Prerequisite: CS 497

Group software engineering project requiring completion of a software system for an approved client. Tasks include project planning, risk analysis, use of standards, prototyping, configuration management, quality assurance, project reviews and reports, team management and organization, copyright, liability, and handling project failure. Credit for CS 497 is awarded after CS 498 has been completed.