

COMPUTER SCIENCE

The discipline of computer science involves the study of algorithmic processes that describe and transform information, encompassing theory, analysis, design, efficiency, implementation, and application. The principal subject areas in computer science include algorithms and data structures, architecture, artificial intelligence and robotics, database and information retrieval, human-computer communication, numerical and symbolic computation, operating systems, programming languages, and software methodology and engineering.

The Department offers two major concentrations, Computer Science and Information Systems, and a minor in Computer Science. The programs are designed and regularly updated to develop the student's creative yet disciplined problem-solving abilities, to expose the student to current developments in the rapidly evolving field of computer science, and to develop understanding of the social and professional context of the field.

MAJOR IN COMPUTER SCIENCE (45 credits)

REQUIRED: 11 courses (33 credits)

CMP 111 & 112 Computer Science	CMP 336 Org of Prog Lang
CMP 221 Data Structures	CMP 344 Design & Analysis
CMP 222 Computer Architecture	CMP 343 Software Engineering
CMP 333 Operating Systems	MTH 122 Discrete Mathematics
CMP 334 Computer Comm & Networking	MTH 125 Calculus I

ELECTIVES: Any 9 credits in CMP from 110 and above and 3 additional credits from MTH 126 and above.

CONCENTRATION IN INFORMATION SYSTEMS (45 credits)

REQUIRED: 11 courses (33 credits)

CMP 111 & 112 Computer Science	CMP 334 Comp Comm & Networking
CMP 221 Data Structures	CMP 340 Information Systems
CMP 222 Computer Architecture	CMP 341 Database Concepts
CMP 231 Apps Programming	CMP 343 Software Engineering
CMP 333 Operating Systems	MTH 122 Discrete Mathematics

ELECTIVES: Any 6 credits in Math & 6 credits in Computer Science from CMP 110 and above (MTH 125 recommended).

NOTES: Students majoring in Computer Science and Information Systems are required to complete a project in Software Engineering. This project must be presented to the Computer Science faculty and accepted by the faculty prior to graduation.

In order to take a course with listed prerequisites, the student must have received a grade of C- or higher, or obtained the consent of the department.

MINOR IN COMPUTER SCIENCE (18 credits)

REQUIRED: 3 courses (9 credits)

111 & 112 Computer Science I & II

221 Data Structures

Choose: Any 3 courses (9 credits) from Computer Science.

COURSE DESCRIPTIONS**110. Overview of Computer Science****1 credit**

This course is designed to give the student a broad overview of the rich and diverse field of computer science. The following topics that may be covered in this class are: historical overview, programming, networks and communications, artificial intelligence and robotics, computer hardware, parallel processing, information systems, ergonomics, windowing environments, ethical issues, impact of computers on society, and careers within the discipline.

111. Computer Science I**3 credits**

This introduction to programming follows a bottom-up methodology. Representation of data in binary, transistors, gates, combinatorial circuits, memory, registers, and elementary processing logic are presented. Basic elements of low-level program design, testing, and debugging are presented, using a low-level microprocessor emulator. Introductory programming constructs and data structures will be introduced. Hands-on experience with a variety of computer hardware is gained in a weekly lab.

112. Computer Science II**3 credits**

This course builds upon CMP 111, refining programming skills and introducing high-level concepts using a modern structured programming language. Functions, parameters, scope, and control structures will be introduced. Basic data structures, pointers, file representation, and records are covered, as well as fundamental algorithms for sorting, searching, recursion, and advanced input and output. Emphasis on students gaining real-world programming experience. Includes a weekly laboratory.

221. Data Structures**3 credits**

This course covers data structures and algorithms. Topics covered include data structures, data abstraction and object-oriented design, and algorithm analysis. The design and implementation of lists, stacks, queues, trees, and graphs as well as searching, sorting, and merging algorithms are covered. Issues in memory and storage management are investigated. **Prerequisite: CMP 112.**

222. Object Oriented Programming**3 credits**

This course is intended to introduce students to the object-oriented (OO) programming paradigm. It will focus on important OO principles such as encapsulation, inheritance, and polymorphism. Students will delve into common design patterns of object-oriented code, focusing on the issues of proper design and reuse. The course will make use of a modern object-oriented programming language and an object-oriented modeling language. **Prerequisite: CMP 112.**

226. Advanced Computer Applications **3 credits**

This course provides the student with the opportunity to apply computer software packages to appropriate projects. Software packages may include spreadsheets, graphics, database management, desktop publishing, communications and project management. The emphasis will be on applying the software packages to the management of information and problem solving in business. **Prerequisite: CMP 111 or consent of instructor.**

231. Applications Programming **3 credits**

This course presents principles of business information systems programming. Emphasis on file-handling, including sequential and random access files, and database programming. **Prerequisite: CMP 112.**

237. Selected Computer Language **1-3 credits**

A computer language is studied in this course. A focus is on developing applications which make use of the paradigms supported by the language. **Prerequisite: CMP 111 and sophomore standing or consent of instructor.**

249. Computer Graphics **3 credits**

Interactive computer graphics techniques, graphics primitives, transformations, segments, windowing, clipping, three-dimensional graphics. **Prerequisites: CMP 112 and MTH 125.**

255. Independent Study **1-3 credits**

All proposals for independent study which are intended to count towards a major or minor in Computer Science must be approved by the instructor who must be a member of the Computer Science Department. In addition, the results of the study must be presented to the Computer Science Department. **Prerequisite: consent of instructor.**

333. Operating Systems **3 credits**

This course examines the design and implementation of computer operating systems, which are the programs that act as resource managers in computer systems. Topics include fundamentals of processes and timesharing, primary and secondary storage management, input/output processing and user-machine interfacing.

Prerequisite: CMP 221.

334. Computer Communications and Networking **3 credits**

This course will examine principles and practices used to effect communications between computers, hardware devices, and other computers. Included will be examination of ports, communications servers, serial, parallel, local area and wide-area networks, Ethernet, and the TCP/IP protocol. **Prerequisite: CMP 333.**

336. Organization of Programming Languages **3 credits**

This is an applied course in programming language constructs emphasizing the run-time behavior of programs. Topics include data types and structures, control structures and data flow, subroutines, recursion, dynamic storage allocation, and formal language concepts. **Prerequisite: CMP 221.**

340. Information Systems **3 credits**

This course provides background by defining and explaining technical, behavioral, economical, and organizational concepts relevant to information needs for decision making. The student is introduced to financial, technical, and strategic-planning information systems. The design, planning, organizing, and controlling of user services, and the management of systems are key elements of the course. **Prerequisite: CMP 111 and Junior standing.**

341. Database Concepts **3 credits**

This course introduces logical and physical data structures, database design, design objectives, commercial database management systems, and database administration. Relational and object models are introduced along with such concepts as query languages, data dictionaries, and distributed networks. **Prerequisite: CMP 221.**

343. Software Engineering **3 credits**

This course presents a formal approach to state-of-the-art techniques in software design and development. An integral part of the course is the involvement of students working in teams in the organization, management, and development of a large software project. **Prerequisites: CMP 221.**

344. Design and Analysis of Computer Algorithms **3 credits**

This course covers the theory, design, implementation, and analysis of algorithms in depth. Topics covered include: methods of algorithm analysis and verification; algorithmic strategies such as divide and conquer, dynamic programming, and backtracking; complexity classes; sorting, searching, and pattern matching; graph and tree processing; optimization algorithms; theory of computability and undecidability; and parallel and distributed algorithms. **Prerequisite: CMP 221.**

349. Topics in Computer Science **3 credits**

This course investigates one or more current topics in the field of computer science. **Prerequisite: CMP 221 and Junior standing.**

390. Computer Science Internship **3-9 credits**

Students who qualify may be placed with a company according to availability of internship positions and college regulations. Consult the department chair for requirements.

439. Numerical Analysis (MTH 439) **3 credits**

This course develops algorithms involving iteration to approximate solutions to various kinds of problems. It studies finite differences, interpolating polynomials for numerical differentiation and integration, as well as the solution of equations and differential equations. The hand calculator and personal computer are the normal tools for this course. **Prerequisites: MTH 126 or consent of instructor.**