

Computer Science

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COMPUTER SCIENCE MAJOR

The Department offers courses leading to a Bachelor of Science in Computer Science with concentrations in Computer Science, and Information Systems, and a minor in Computer Science. The goal of these programs is to train graduates for successful careers in industry and to prepare students for graduate studies. Students are encouraged to do cooperative work with local companies for up to one year, receiving up to four course credits, job experience, and (normally) compensation in the process. Such experience is also beneficial in seeking postgraduate employment.

The General Education Requirement:

All students must satisfy a general education requirement consisting of eleven (11) courses outside of the major department. The General Education Goal 2 (Quantitative) requirement is satisfied through the completion of the Computer Science major.

Course Prerequisites

Courses may have specified conditions for enrollment, such as prior completion of less advanced courses, permission of the instructor, or appropriate placement test scores. Students should refer to course descriptions in the department listings for prerequisite requirements.

COMPUTER SCIENCE MAJOR

Departmental Requirements

Computer Science majors must complete core requirements as well as additional requirements for the particular concentration chosen (see below).

The following six (6) core requirements are required of Computer Science majors in all concentrations:

CSCI 120	Introduction to Information Technology
CSCI 152	Computer Science I Using Java
CSCI 252	Computer Science II Using Java
CSCI 258	Introduction to Operating Systems Using UNIX™
CSCI 360	Database Management
MATH 117	Introduction to Statistics

CONCENTRATIONS

All students majoring in Computer Science must choose one (1) of the two (2) concentrations: Computer Science General or Information Systems.

CONCENTRATION IN COMPUTER SCIENCE (UCSG)

This concentration prepares students for careers in software development.

Required Computer Science courses (13):

CSCI 271	Data Structures
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CSCI 317*	Discrete Structures
CSCI 347	Analysis of Algorithms
CSCI 352	Computer Architecture & Assembly Language
CSCI 362	Software Engineering
CSCI 460	Theory of Computing
CSCI 465	Operating Systems Internals
CSCI 477	Computer Networking

**MATH 294 Discrete Mathematics II may be substituted for CSCI 317 Discrete Structures*

Choose Two (2) Computer Science Electives:

CSCI 306	Introduction to .NET Using Visual Basic
CSCI 320	Windows Server & Client Management
CSCI 333	Object-Oriented Programming Using C++
CSCI 340	UNIX System Administration
CSCI 345	Computer & Network Security
CSCI 373	Advanced Web Technologies
CSCI 400	Special Topics in Computer Science
CSCI 404	Seminar in Computer Science
CSCI 428	Software Quality Assurance
CSCI 455	Human-Computer Interaction

Mathematics and Science Requirements:

One (1) Required Mathematics Courses:

MATH215	Finite Mathematics or
MATH 292	Discrete Mathematics I

Two (2) Required Science Courses:

(One (1) must be a lab course open to science majors)

Goal 6 General Education Course

Goal 7 General Education Course

One (1) Additional Mathematics Course (beyond MATH 200 Precalculus) or Science Elective

CONCENTRATION IN INFORMATION SYSTEMS (UCSI)

This concentration trains students for technical careers in information systems such as database administration, network administration, systems analysis and design, and software quality assurance.

Required Computer Science courses (9):

CSCI 108	HTML, JavaScript Programming, and Web Site Development
CSCI 345	Computer and Network Security
CSCI 373	Advanced Web Technologies
CSCI 376	Networking Technologies

One (1) required Mathematics courses:

MATH 292	Discrete Mathematics I
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Five (5) required Business Courses:

ACCT 220	Introduction to Financial Accounting
BADM 280	Applied Organizational Theory and Management
BADM 398	Projects in Information Systems
BADM 477	Management Issues in Information Technology
ECON 101	Principles of Macroeconomics (Goal 10) or ECON 102 Principles of Microeconomics (Goal 9)

Three (3) courses from at least two (2) of the following categories:*Network and System Administration:*

CSCI 320	Windows Server and Client Management
CSCI 340	UNIX™ System Administration

Computer Graphics and Technical Writing:

CSCI 140	Introduction to the Internet, Graphics and Multimedia
ENGL 286	Professional Writing
ENGL 371	Business Writing
ENGL 372	Technical Writing

General Information Systems Electives:

Any computer science course at the 200-level and above except courses listed in the Network and Systems Administration category above and CSCI 495/496 Cooperative Program in Computer Science.

Note: Students may need to take additional mathematics courses if their math placement score does not qualify them for MATH 292 Discrete Mathematics I. These mathematics courses would be taken as free electives. CSCI 135 Information Technology and Society and other computer science course can be taken as a free elective.

**MAJOR IN BUSINESS & INFORMATION TECHNOLOGY (UITB)
(Home Department-Economics & Business Administration)**

This major is a collaboration with the Business Administration and Computer Science departments and provides students with knowledge in both the business and information technology fields. The intent of this program is to prepare the Business and Information Technology program can “bridge the gap” between technology and business. As entry level workers, they are likely to qualify for jobs as systems analysts, Project Management Office administrators, technical trainers, quality assurance analysts and similar roles. As experienced workers, they are likely to move into Project Management, Delivery Assurance and IT Management roles.

Required Business core courses (14):

ACCT 220	Introduction to Financial Accounting
ACCT 221	Introduction to Managerial
BADM 215	Legal Environment of Business
BADM 280	Applied Organizational Theory and Management
BADM 330	Managerial Finance I

BADM 372	Operations and Project Management
BADM 398	Projects in Information Systems
BADM 477	Management Issues in Information
ECON 101	Principles of Macroeconomics
ECON 102	Principles of Microeconomics
ECON 201	Quantitative Economics and Business I
ECON 202	Quantitative Economics and Business II
MATH 123	College Algebra (Gen Ed Goal 2)
MRKT 271	Marketing Principles

Required Computer Science core courses (6):

CSCI 108	HTML, JavaScript Programming, and Web Site Development
CSCI 120	Introduction to Information Technology
CSCI 152	Computer Science I Using Java
CSCI 258	Introduction to Operating Systems Using UNIX
CSCI 360	Database Management
CSCI 376	Networking Technologies

MINORS**MINOR IN COMPUTER SCIENCE (5 COURSES)****Required Courses (4):**

CSCI 120	Introduction to Information Technology
CSCI 152	Computer Science I Using Java
CSCI 252	Computer Science II Using Java
CSCI 258	Introduction to Operating Systems Using UNIX™

Elective (1):

One other course from the Computer Science Department.

MINOR IN INFORMATION SYSTEMS (5 COURSES)

Required Courses (5) – Select from any courses offered through the Computer Science Department. This includes CSCI 140 Introduction to the Internet, Graphics, and Multimedia. At least one (1) of these courses must be at the 200-level or above.

MINOR IN INFORMATION TECHNOLOGY (5 COURSES)

The University offers an interdisciplinary minor in Information Technology. To earn a minor in Information Technology, students must apply in writing to the Chair of the Computer Science Department. To complete the minor, four (4) of the five (5) courses must be taken outside the student's major department. No course may fulfill both major and minor requirements, but courses in the minor may be used to fulfill general education requirements. No Information

Technology minor will be awarded without compliance with the above format.

The minor requires five (5) courses as follows:

Three (3) required courses:

BADM 200	Introduction to Business Systems
CSCI 120	Introduction to Information Technology (must be taken prior to other courses in the minor)
CSCI 140	Introduction to the Internet, Graphics, and Multimedia or COMM 140 Introduction to the Internet, Graphics, and Multimedia

Two(2) electives from the following list:

Communication Arts:

COMM 200	Introduction to Computer Graphic Design
COMM 225	Multimedia Design
COMM 316	Advanced Multimedia
COMM 327	Computer Animation Techniques

Computer Science:

CSCI 108	HTML, JavaScript Programming, and Web Site Development
CSCI 152	Computer Science I Using Java
CSCI 230	Principles of Information Technology Operations
CSCI 252	Computer Science II Using Java
CSCI 258	Introduction to Operating Systems using UNIX
CSCI 306	Introduction to Visual Basic
CSCI 320	Windows Server and Client Management
CSCI 345	Computer and Network Security

Geography:

GEOG 214	Geographic Techniques – Quantitative Methods
GEOG 216	Introduction to Geographic Information Systems
GEOG 316	Advanced Geographic Information Systems
GEOG 328	Introduction to Remote Sensing

Mathematics:

MATH 117	Introduction to Statistics or MATH 208 Biostatistics
MATH 307	Intermediate Statistics

Computer Science Courses Appropriate for General Education (Gen. Ed.)

Courses		Goal
CSCI 108	HTML, JavaScript Programming, and Web Site Development	5
CSCI 135	Information Technology and Society	10
CSCI 138	Information Technology and the Environment	10

COMPUTER SCIENCE COURSE DESCRIPTIONS

CSCI 108 HTML, JavaScript Programming, and Web Site Development (Gen. Ed. Goal 5)

An introduction to various features of HTML and JavaScript languages such as tags, images, buttons, forms, and animation files. Students learn to program using these languages to create interactive Web pages. Students create a complete Web site using various tools including a browser and image editor.

CSCI 120 Introduction to Information Technology

An overview of computer concepts and Information Technology (IT). Applications of IT in various disciplines are illustrated and the role of information technology in contemporary society, including issues of intellectual property, ethics, privacy and security is discussed. Students are introduced to windowed environments, file management, problem-solving tools and a high-level programming language. Advanced concepts of word processing, spreadsheets, and presentation software required for effective communication, analysis, and design are explored. **Note:** Students cannot receive credit for both this course and 63.151 Personal Computer (PC) Fundamentals and Applications. Students in the IT minor who have taken 63.151 Personal Computer (PC) Fundamentals and Applications should take CSCI 108 HTML, JavaScript Programming and Web Site Development in lieu of CSCI 120 Introduction to Information Technology.

CSCI 135 Information Technology and Society (Gen. Ed. Goal 10)

An exploration of the impact of computing and information technology (IT) on individuals and society in the United States and the world. The course addresses the impact of IT on areas such as: digital technology at home; personal devices; rapid unregulated spread of (mis)information; political processes of dissemination and polling capabilities; empowering individuals and families with information included in medical and other databases; personal and work place communication; the networked information economy and globalization. Other topics may include the interaction of IT with intellectual property, privacy, ethics, security concerns and freedom of expression.

CSCI 138 Information Technology and the Environment (Gen. Ed. Goal 10)

A study of how information technologies can support and affect a clean and sustainable environment. Technologies such as virtualization, data centers, cloud computing, smart grid, tracking, imaging, simulation, document management, sensors, analog/digital devices, telecommuting, and teleconferencing are discussed. Use of social network groups to increase awareness and to mobilize action on environmental issues is addressed. The use of these information technologies in the United States is considered through the examination of geographically distributed resources such as water, glaciers, forests, species, and renewable wind and solar energies. The environmental impact of social consumption, recycling, and improper disposal of IT systems is addressed. The impact of technological forces in the United States on global environment is examined. **Note:** Computer Science majors may take this course as a free elective.

CSCI 140 Introduction to the Internet, Graphics, and Multimedia

An introductory course exploring fundamental concepts, vocabularies, and techniques related to graphic design, digital cameras, photo editing, scanning, web design, interactive design, animation and multimedia using a variety of software programs. Students gain a broad foundation that can be applied to more advanced concepts and skills in the Information Technology discipline. *Students cannot receive credit for both this course and either COMM 140 Introduction to the Internet, Graphics, and Multimedia or 84.140 Introduction to the Internet, Graphics, and Multimedia.*

CSCI 152 Computer Science I Using Java

An introduction to problem solving using the Java programming language. The course stresses algorithms, object-oriented programming in graphical environments, documentation, testing, and debugging. Topics include hardware basics and number systems, classes, methods, control structures, types, virtual-machine concepts, Internet and client-server computing, human-computer interaction, social, professional, and ethical issues, and general features of programming languages.

Corequisite: MATH 123 College Algebra or minimum score of 2 on the math placement examination.

Prerequisite: CSCI 120 Introduction to Information Technology or permission of instructor.

CSCI 230 Principles of Information Technology Operations

A study of operations in various information technology areas used at workplaces. Areas covered include managing storage, troubleshooting, printing and faxing, small local networks, connecting to the Internet, protection against viruses, pop-ups, and malware, backup and restore, and email clients.

Prerequisite: CSCI 120 Introduction to Information Technology

CSCI 252 Computer Science II Using Java

An intermediate programming course that emphasizes debugging, documentation, and modular and object-oriented design with tools such as the Unified Modeling Language. Topics include event-driven programming, string and array manipulation, sorting and searching, file operations, dynamic memory allocation, inheritance, polymorphism, and exception handling.

Prerequisites: MATH 200 Precalculus (may be taken concurrently) and CSCI 152 Computer Science I Using Java.

CSCI 258 Introduction to Operating Systems Using UNIX™

An introduction to the basics of networking and operating systems. Topics include the evolution and overview of operating systems, operating system principles, interfaces (GUI, command line, and API), command processors and utilities, file systems, access control, processes, programming and scripting, user accounts and authentication, OSI model, Internet Protocol, networking utilities, net computing, client-server model, FTP, and network file systems. The UNIX™ operating system is used as a primary reference for illustration and hands-on experience.

Prerequisite: CSCI 120 Introduction to Information Technology or CSCI 152 Computer Science I Using Java.

CSCI 271 Data Structures

An in-depth presentation of recursion, collections and iterators, fundamental techniques in graphics, and threading. Students implement linked lists, stacks, queues, trees, heaps, graphs, hash tables and related algorithms. Students implement a significant programming project.

Prerequisites: MATH 200 Precalculus and CSCI 252 Computer Science II Using Java.

CSCI 300 Artificial Intelligence

An introduction to cognitive science and efforts to implement intelligence in computer hardware and software, with application areas. Topics include search, knowledge representation, reasoning, uncertainty, learning, embodied interaction, future prospects, and philosophical considerations. Concepts are demonstrated with software.

Prerequisites: Junior standing, CSCI 258 Introduction to Operating Systems Using UNIX™, and either MATH 117 Introduction to Statistics or MATH 200 Precalculus.

CSCI 306 Introduction to .NET using Visual Basic

An introduction to the .NET programming environment and the object oriented programming model using the Visual Basic .NET programming language. Topics include object-oriented programming, Visual Basic .NET objects such as forms and controls, code construction, functions and subroutines, parameter passing, looping and other programming structures, persistence of data using text files and database tables, error handling, and debugging of programs. **Note:** Students cannot receive credit for both CSCI 306 Introduction to .NET using Visual Basic and 63.205 Introduction to .NET using Visual Basic.

Prerequisite: CSCI 252 Computer Science II using Java.

CSCI 317 Discrete Structures

An intermediate to advanced course on discrete mathematical structures used in computer science. Students study abstract structures used to represent discrete objects and the relationships between these objects. Topics include principles of logic, incompleteness, diagonal proof, inductive proof, and correctness of simple algorithms. Coverage of set theory will extend to relations, graphs, functions, countability, formal languages, and non-well-foundedness. Students write recurrences to define computable functions and explore discrete probability and randomness from a computational viewpoint.

Prerequisites: CSCI 271 Data Structures and either MATH 215 Finite Mathematics or MATH 292 Discrete Mathematics I.

CSCI 320 Windows Server & Client Management

Designed to teach students how to plan, set up, and configure Windows server and client workstations with TCP/IP enterprise protocol; monitor and control security within the systems network; administer user accounts, system disks, file system, mail, print and remote access services; and recover from server failures.

Prerequisite: CSCI 252 Computer Science II Using Java.

CSCI 321 Digital Electronics

An introduction to the techniques of designing and constructing digital circuits with emphasis on understanding the logic circuits of a digital computer. Topics discussed include: application of Boolean algebra to logic design; operation of diodes and transistors; construction of IC logic gates; characteristics of TTL, ECL and CMOS logic families; using Karnaugh Maps to design combinatorial circuits; decoders; priority encoders; multiplexers; parity circuits; adders, subtractors and ALU's; latches and flipflops; counters; shift registers, and the design and analysis of synchronous state machines. Includes a weekly three-hour laboratory period.

Prerequisite: CSCI 152 Computer Science I Using Java.

CSCI 333 Object-Oriented Programming Using C++

A presentation of advanced features of programming with an emphasis on class construction and object-oriented design and programming. Topics covered include namespaces, encapsulation, function and operator overloading, templates, collection classes, containers, iterators, inheritance, polymorphism, and exception handling. Course touches on Standard Template Libraries (STL). NOTE: Students may not receive credit for both CSCI 333 Object-Oriented Programming Using C++ and 63.259 Object-Oriented Programming Using C++.

Prerequisite: CSCI 252 Computer Science II Using Java.

CSCI 340 UNIX™ System Administration

A comprehensive coverage of UNIX™ system administration and management. Topics include system setup, booting and shutdown, management of user accounts, file systems, disk management and serial device management, backup and restore, print and network configuration, security, system logs, performance monitoring, and maintenance.

Prerequisite: CSCI 258 Introduction to Operating Systems Using UNIX™.

CSCI 345 Computer & Network Security

A detailed study of the concepts and principles of computer and network security. Topics may include: physical and organizational security, cryptography, public key infrastructure, system and services security, networking fundamentals and protocols, worms and viruses, attacks, prevention, detection and recovery, law, ethics, and privacy. The Windows and UNIX operating systems are used for illustrations.

Prerequisite: CSCI 258 Introduction to Operating Systems Using UNIX™.

CSCI 347 Analysis of Algorithms

A presentation of asymptotic time and space complexity of sequential and parallel algorithms, using big-O and related notation. Complexity classes P and NP (tractable and intractable problems) and verification of algorithms by formal methods are also discussed.

Prerequisites: CSCI 271 Data Structures and MATH 292 Discrete Mathematics I.

CSCI 352 Computer Architecture and Assembly Language

An introduction to digital logic components, their organization in computer systems, and assembly language programming. Topics include gates and flip-flops, register transfer, and CPU design; memory organization, I/O interfaces, and the interrupt system; representation of data, addressing modes, CPU instructions and pseudo-instructions, assembly language, and the organization of low-level software to control the computer.

Note: Students cannot receive credit for this course if they have taken 63.355 Computer Architecture.

Prerequisite: CSCI 271 Data Structures

CSCI 360 Database Management

A comprehensive coverage of database concepts, design, and implementation. Topics include systems analysis, data modeling, relational databases, logical design, normalization, user interfaces, query processing including SQL, database administration, security, backup and restore, and performance evaluation. Popular databases are referenced. **Note:** Students cannot receive credit for both CSCI 360 Database Management and CSCI 467 Data Base Management Systems.

Prerequisite: CSCI 258 Introduction to Operating Systems Using UNIX™.

CSCI 362 Software Engineering

Principles of systematic program design and implementation. Structured programming and top-down segmented program development. Stepwise program development. Chief Programmer Team, HIPO, and other programming techniques. Decision tables. Program correctness and verification. Software reliability.

Prerequisite: CSCI 271 Data Structures.

CSCI 373 Advanced Web Technologies

An introduction to dynamic database-driven Web site development. Students learn about client- and-server-side scripting, maintaining persistent information on the Web, and user-interface design concepts.

Prerequisites: CSCI 108 HTML, Java-Script Programming, and Web Site Development, CSCI 152 Computer Science I Using Java and CSCI 360 Database Management.

CSCI 376 Networking Technologies

An introduction to net-centric computing, communication and networking, network security, network management, client-server computing, wireless and mobile computing, and network applications. Various LAN and WAN networking technologies such as Ethernet, Token Ring, wireless network, virtual private network, personal area network, Storage Area Network, Internet, ATM, telecommunication networks, multimedia data technologies, and internetworking are covered. Business aspects of computer networks are also covered. **Note:** Students cannot receive credit for both CSCI 376 Networking Technologies and 63.476 Networking Technologies.

Prerequisite: CSCI 258 Introduction to Operating Systems Using UNIX™.

CSCI 400 Special Topics in Computer Science

A study of a selected topic in computer science to be given from time to time at the discretion of the Department. Topics presented here are on a one-time-only basis and will not be a permanent part of the curriculum.

Prerequisite: Computer Science major, Junior standing, or permission of the instructor.

CSCI 404 Seminar in Computer Science

An exploration of an advanced topic in computer science. The particular topic is announced at least one semester in advance.

Prerequisite: Permission of the instructor.

CSCI 428 Software Quality Assurance

A study of software quality assurance processes and test tools. Topics include requirements analysis, test specifications, test schedule development, installation and test tools, standalone product testing, systems integration testing, interoperability, problem reporting and tracking, product development and quality assurance processes, QA management, product life cycle, software metrics for quality, and product release.

Prerequisite: CSCI 258 Introduction to Operating Systems Using UNIX™.

CSCI 455 Human-Computer Interaction

A survey of the field of Human-Computer Interaction (HCI). Emphasis is placed on design strategies for creating and refining an effective user interface throughout the software product life cycle. Task analysis, approaches to user interface design, modeling, and user interface standards are covered as student groups develop a user interface for a software product.

Prerequisites: CSCI 152 Computer Science I Using Java and CSCI 360 Database Management.

CSCI 460 Theory of Computing

An introduction to theoretical computer science and some key applications. Course examines models of computation, including finite automata, transducers, pushdown automata, and Turing machines. Concepts of formal language theory are applied to lexical analyzer and compiler construction in programming-language translation. The course will include an introduction to the notions of computability and computational complexity, concepts used in parallel computation, and some aspects of artificial intelligence.

Prerequisites: MATH 292 Discrete Mathematics I and CSCI 271 Data Structures.

CSCI 465 Operating Systems Internals

An in-depth coverage of operating system principles and internals such as processes, threads, CPU scheduling, concurrency and process synchronization, deadlock, inter-process communication, memory management, virtual memory, file systems, I/O systems, distributed systems, and protection and security. Several of the concepts are implemented through a programming project.

Prerequisites: CSCI 258 Introduction to Operating Systems Using UNIX™, and CSCI 352 Computer Architecture and Assembly Language.

CSCI 477 Computer Networking

An introduction to the seven layers of the OSI model. General topics include network topologies; introduction to Local Area Networks, such as Ethernet, Token Ring, and FDDI; and internet-working. Special topics include TCP/IP and FTP protocols, socket interface, Remote Procedure Call (RPC), and client-server architecture.

Prerequisite: CSCI 271 Data Structures or equivalent computer industry experience including strong programming skills in C or C++.

CSCI 490 Directed Study in Computer Science

Under the direction of a faculty member, the student researches a topic or topics in computer science. Students should make arrangements with the faculty member who is to direct their work one semester in advance of the work.

CSCI 495 Cooperative Program in Computer Science (2 course-credits)

A cooperative program in which students are placed in computer positions in corporate or government settings. Students are expected to work a minimum of 25 hours per week. These positions are normally compensated. Upon completion of the course, students will provide written documentation concerning their work projects.

Prerequisite: Upperclass standing in computer science with at least a 3.0 average in computer courses or permission of instructor.

CSCI 496 Cooperative Program in Computer Science (2 course-credits)

A cooperative program in which students are placed in computer positions in corporate or government settings. Students are expected to work a minimum of 25 hours per week. These positions are normally compensated. Upon completion of the course, students will provide written documentation concerning their work projects. Note: This course may not be taken concurrently with CSCI 495.

Prerequisite: Upperclass standing in Computer Science with at least a 3.0 average in computer courses or permission of instructor.