COMPUTER SCIENCE

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Instructor: Sheila D. Shea

PROGRAMS OFFERED

Bachelor of Science – Computer and Information Studies

Options
Computation Theory
Computer Systems
Embedded Systems
Information Systems
Object-Oriented Methods
Parallel Computing

Minor
Computer Studies

Programs in Computer Science

Computer Science courses are incorporated into such other majors as Business Administration, Mathematics, Political Science, Psychology, and Sociology, and may be taken as free electives by students in any discipline.

Computer Science courses may not be used to satisfy the laboratory science sequence requirement. However, any of the courses CSC 100, CSC 190, CSC 200A, or CSC 201J may be used as a Division II distribution elective. Any of the courses CSC 100, CSC 200A or BTE 117 may be used to satisfy the Computer Literacy Competency-Based Skills Core requirement.

The major in Computer and Information Studies is intended to provide the student with a broad understanding of modern computers, including basic design, organization, and operating principles. The role of the computer as a general-purpose problem-solving tool is emphasized.

Through lectures and extensive laboratory experiences the student is exposed to the most common computer environments and the most common programming languages in current use, to a systematic methodology of software design and implementation, and to a wide variety of applications, as well as to the theoretical foundations of Computer Science. Through the choice of an Option (see left) and appropriate upper-division electives, the student can specialize in a particular area such as computation theory, information systems, or embedded systems.

In addition to preparing students for careers in a variety of computer-related areas, the curriculum in Computer and Information Studies also provides a foundation for further study at the graduate level.

The major program in Computer and Information Studies consists of fifteen Computer Science courses, together with five support courses in Mathematics and one in Physics, one additional science course, and a Division II lab science sequence chosen from a specified list. (See flow sheet.)

Although the major in Computer and Information Studies does not require the completion of a minor, students in the program are urged to consider using some of their electives to assemble a minor in an area where there are computer applications. A minor in Mathematics is particularly convenient since most of the Mathematics support courses can be used as part of this minor

Other possibilities include Business Administration or one of the sciences. (Before embarking upon a minor, the student should confer with the chairperson of the appropriate department to determine the proper selection of courses.)

Retention in the Program

In order to remain in the Computer and Information Studies degree program a student must maintain a cumulative grade-point average of 2.7 (B-) or higher in computer courses and 2.3 (C+) or higher in the support courses. Exceptional circumstances will be handled on an individual basis.

Note: As indicated on the flow sheet, each student in the Computer and Information Studies major must select one of the available two-course Options listed above.

Minor in Computer Studies

The minor in Computer Studies consists of five courses (18-19 credits) selected as follows:

CSC 200A	Survey of Computer Science I	3
CSC 201J	Software Design and Programming I	4
CSC 202J	Software Design and Programming II	4
CSC 260	Data Structures and Algorithms	4
CSC ___	(Either CSC 245A or a CSC elective numbered above 260 *)	3-4
Total Credits		18-19

* Directed Study (CSC 501) and Internship (CSC 267) may not be applied to the minor in Computer Studies.

Computer Science
Salem State College
Advisor: _____

Name:_____
Date admitted into Major:_____
Transfer credits:_____

BACHELOR OF SCIENCE
COMPUTER AND INFORMATION STUDIES

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CORE REQUIREMENTS

Competency-Based Skills

@❑ Basic College Math
@❑ Reading Comprehension
@❑ Computer Literacy
_____

@	ENG	101	Composition I	3 _____
@	ENG	102	Composition II	3 _____
@	SPC	101	(Speech)	3 _____
@	SFL	194	Health and Wellness	3 _____

Physical Education Activities (1 cr. total)

@ SFL ____ _____ — _____
@ SFL ____ _____ — _____

Distribution Sequences (20 credits)

____ ____ (Literature I) 3 _____
____ ____ (Literature II) 3 _____
____ ____ (Lab Science I) 3-4 _____
____ ____ (Lab Science II) 3-4 _____
@ HIS 101 History of World Civilization I 3 _____
@ HIS ____ (History II) 3 _____

Distribution Electives (18 credits)

Among the distribution electives, the student must earn at least 3 but no more than 9 additional semester hours in each of the three divisions.

Humanities (Division I)

____ ____ _____ — _____
____ ____ _____ — _____
____ ____ _____ — _____

Science/Mathematics (Division II)

____ ____ _____ — _____
____ ____ _____ — _____
____ ____ _____ — _____

Social Sciences (Division III)

____ ____ _____ — _____
____ ____ _____ — _____
____ ____ _____ — _____

(Note: Courses allowable as distribution electives are marked 'D' in the College Catalog or indicated by appropriate footnotes.)

COURSES IN MAJOR (49 credits)

Required Courses:

CSC	200A	Survey of Computer Science I	3	_____
CSC	201J	Software Design & Programming I	4	_____
CSC	202J	Software Design & Programming II	4	_____
CSC	215	Survey of Computer Science II	4	_____
CSC	260	Data Structures & Algorithms	4	_____
CSC	____	(CSC 245A, 273 or 311)	4	_____
CSC	266	Software Engineering	4	_____
CSC	280	Operating System Principles	3	_____
CSC	295	Computer Architecture and Organization	3	_____
CSC	498	Project Specification & Design Practicum	1	_____
CSC	500	Directed Study in Computer Science I	3	_____

Option:_____(see below)

CSC ____ _____ — _____
CSC ____ _____ — _____

Information Systems Option: CSC 263, CSC 320
Computation Theory Option: CSC 290, CSC 415
Parallel Computing Option: CSC 245A, CSC 445
Objects Oriented Methods Option: CSC 311, CSC 312A
Computer Systems Option (two of): CSC 271, CSC 315A, CSC 390
Embedded Systems Option: CSC 230 CSC 330A

Computer Electives

(Two CSC courses numbered above 200A, with at least one numbered 290 or above.)

CSC ____ _____ — _____
CSC ____ _____ — _____

SUPPORT COURSES (24 credits)

____	____	(Science course chosen from list ***)	4	_____
PHS	205	Digital Circuit Design	4	_____
MAT	220	Calculus I	4	_____
MAT	221	Calculus II	4	_____
MAT	214	Discrete Structures	3	_____
MAT	247	Statistics I	3	_____
MAT	____	_____	3	_____

Note: The unspecified Mathematics course must be chosen from MAT 304A, 308, 316 or 323. With one additional 300-level Mathematics course, the requirements for a Mathematics minor would be satisfied. Students choosing to declare such a minor must declare by filing the appropriate form with the Registrar's Office.

FREE ELECTIVES (minimum: 4 credits)

____ ____ _____ — _____
____ ____ _____ — _____

</div>

@ Requirements so marked should be completed within the first 53 credits of study (i.e., before Junior status). Exceptions will be made for transfer students.
The laboratory science sequence must be chosen from the following list: BIO 131-132, CHE 130-131, CHE 130-212, PHS 211A-212A, PHS 221-222, GLS 100-201.
*** The support science course must be chosen from the following list: BIO 131, CHE 130, CHE 212, GGR 101P, GLS 201, PHS 211A, PHS 221.
Note: If a course is used to satisfy two or more requirements (for example, a support course and a distribution elective), the credits are counted in only one place. Using a course to satisfy more than one requirement does **not** reduce the credit total required for graduation.

Total credits for graduation: 127

Effective: 9/04

Computer Science

COURSE DESCRIPTIONS

BUSINESS TECHNOLOGY AND EDUCATION

BTE 117 Microcomputers in the Professions   3 credits
An overview of information processing that is applicable to all career areas, with consideration of societal trends and issues arising from the use of computers. A major focus will be to increase the student's personal and professional productivity through the use of the microcomputer and various software packages. Applications to be covered include: operating systems, spreadsheets, data base management, word processing, graphics, telecommunications, and programming techniques. Three lecture hours per week. Required of all Business Education and Office Administration students. Elective for others. This course satisfies the Computer Literacy Core requirement.

BTE 131 Word Processing   3 credits
This course is designed to teach students basic word processing functions utilizing the latest popular word processing software, creating, revising/editing, printing, formatting, paginating, spell checking documents and creating tables. Three lecture hours per week. Required of all Business Education and Office Administration students; elective for others.
Prerequisite: Minimum keyboarding skills as determined by Department.

BTE 232 Advanced Word Processing Applications   3 credits
A continuation of word processing functions utilizing the latest popular word processing software. Advanced topics to include: newspaper and parallel columns; outlining; creating reports with headers, footers and endnotes; formatting with Macros; merging documents; sorting and selecting. Three lecture hours per week. Required of Business Education and Office Administration students; elective for others.
Prerequisite: BTE 131 or equivalent.

BTE 241 Spreadsheet Applications in the Professions   3 credits
In-depth expansion of the spreadsheet topic introduced in BTE 117. Using the latest PC-based spreadsheet software, students will study 3D spreadsheet models, statistical and financial analysis, advanced graphical analysis, dynamic data exchange links, automation with macros, and backsolver implementation. Techniques for designing and sharing spreadsheets intended for use in the workplace will be stressed. Three lecture hours per week. Required of all Business Education and Office Administration students.
Prerequisite: BTE 117.

BTE 318 Office Management   3 credits
This course involves the study of interrelationships of employees, equipment, and work processes as they relate to the processing of information in the automated office. Areas of study include: location, layout and environment of the office; furniture, equipment and telecommunication devices and selecting, supervising, motivating, and developing the office employee; job analysis, evaluation, and measurement of work processes. Three lecture hours per week. Required of Office Administration Juniors.

BTE 320 Automated Office Procedures/ Simulation   3 credits
This course is an introduction to the basic skills, procedures and responsibilities of office workers in today's electronic office: language arts, integration of information processing; composition development; dictation and machine transcription; FAX transmission; telecommunications; electronic records management; mailing and shipping procedures; and administrative responsibilities. Three lecture hours per week.
Prerequisite: BTE 131.

BTE 321 Computerized Accounting Systems and Procedures I   3 credits
An examination of manual and computerized accounting systems used by today's businesses. Students will use microcomputer-based accounting software and electronic spreadsheets to apply previously learned accounting skills. Analysis and interpretation of computer output with regards to managerial decision-making will be stressed. Three lecture hours per week and additional unscheduled laboratory time.
Prerequisite: ACC 201.

BTE 322 Computerized Accounting Systems and Procedures II   3 credits
This course is a continuation of BTE 321. Students will use electronic spreadsheets to analyze, compare and interpret financial information, to make business decisions, to create sales budgets and performance reports, and to solve many different kinds of accounting problems including depreciation schedules, payroll computations, what-if analysis and cost-volume-profit analysis. Three lecture hours per week. Required of all students in the Accounting-Management concentration.
Prerequisite: ACC 201 or equivalent, BTE 321.

BTE 325 Database Application in the Professions   3 credits
An in-depth expansion of the database topic introduced in BTE 117. Using the latest PC-Based database software students will study design concepts, tables, and defining relationships, indexing, query techniques, report building, and automation with macros. Techniques for administering a database in a shared environment will be stressed. Three lecture hours per week.
Prerequisite: BTE 117.

BTE 410 Management of Information Technology   3 credits
This capstone course is designed to integrate and update previous knowledge and experience in the AIS concentration in the areas of information processing and management. Topics include hardware and software trends, advances in telecommunications and managing changes in technology. Student presentations, based on outside research will be an integral part of the course. Three class hours per week.
Prerequisite: Senior class standing, BTE 318, BTE 302.

BTE 500 Directed Study   3 credits

COMPUTER SCIENCE

Notes: Most Computer Science courses require the completion of assignments in one of the computer laboratories in addition to the three hours per week in scheduled lectures. Students will arrange this laboratory time to fit their individual schedules.
CSC courses numbered below CSC 200 may not be applied to the Computer and Information Studies major or the Computer Studies minor.
CSC 100 is the only Computer Science course which may be used to satisfy the Computer Literacy Competency-Based Skills core requirement.

CSC 100 Computers and Their Uses   3 credits DII
This course provides an overview of the capabilities, uses and limitations of computers. The major types of software package are discussed: operating systems, word processors, database systems, spreadsheets and communications packages. Applications of computers in areas such as business, education, graphic arts, medicine and engineering are surveyed. The major focus of the course is to present these topics in the context of the impact of computers on functions such as decision-making, information storage, research and personal productivity. The general discussion is reinforced by skills-oriented lecture/demonstrations and assignments using specific software packages. Three lecture hours per week plus laboratory work outside of class. This course satisfies the Computer Literacy core requirement.
Prerequisites: High school Algebra I & II.

CSC 120 Legal Aspects of Computer Software   3 credits

Investigation of the laws and legal rights relating to the development, protection, marketing, and home/business use of computer software. Copyright laws, patent and trademark protection, privacy acts, security measures and trade secrets are explored through analysis of job-related and home use of computer software. The course will include development and analysis of written contracts, license agreements, warranty and liability disclaimers, and procedures for handling legal disputes. Three lecture hours per week. Credits for this course may not be applied to the major or minor in Computer Studies.
Prerequisites: CSC 100 or equivalent.

CSC 121 Introduction to Computer Graphics   3 credits

This course presents a broad view of the computer graphics field without requiring a detailed background in computer programming. Various aspects of the field are explored and a number of computer-related graphic techniques are presented. Programming assignments in True Basic and related languages are included. This course is appropriate for students in a variety of curricula, such as Biology, Psychology, Criminal Justice, etc. Credits for this course may not be applied to the major in Computer and Information Studies. Three lecture hours per week, plus laboratory work outside of class.
Prerequisites: High school Algebra I & II.

CSC 132 Computer-Based Statistics   3 credits

This course deals with the computer implementation of common statistical procedures through software packages such as SPSS, BMDP or SAS. The use of basic descriptive statistics, frequency and contingency tables, correlation, regression, analysis of variance, and other procedures is illustrated through case studies and laboratory assignments. Attention is paid to design of experiments, selection and appropriate statistical procedures, and interpretation of results. No previous computer experience required. Three lecture hours per week. Credits for this course may not be applied to the major or minor in Computer Studies.
Prerequisite: One course in applied statistics.

CSC 135 Computers and Planning   3 credits

This course presents a basic understanding of the use of computer application packages in planning. The course is intended for all students who want to get an idea of the help that computers can give in planning for many different disciplines. Examples will be used that will be of interest to Business, Education, Criminal Justice, Nursing, Computer Science and many other majors. Credits for this course may not be applied to the Computer and Information Studies major or minor. Three lecture hours per week plus laboratory work outside of class.
Prerequisite: Fulfillment of the Computer Literacy Competency-Based Skills Requirement.

CSC 145 Applications Programming in C   4 credits

This course presents the principal features of the C language following the ANSI standard, including the C preprocessor, data types, operators, calculations, arrays, strings, structures, pointers, I/O of text and binary files, and the use of run-time libraries. Effective program and report design are emphasized. Programming assignments are drawn from a variety of application areas. Three lecture hours per week, plus extensive laboratory work outside of class. Credits for this course may not be applied to the major or minor in Computer Studies. Not open to students who have received credits for CSC 273, No more than one of the courses numbered CSC 140 through 149 may be counted for degree credits.
Prerequisites: High school Algebra I & II.

CSC 146 Programming in Java with Internet Applications   4 credits

This course presents the principal features of the Java language, including the Java compiler, byte code, data types, standard control structures, classes, objects and methods. Abstraction mechanisms, threads, I/O streams, exception handling, and the use of run-time libraries are also covered. Effective program and output design are emphasized. Programming assignments include both stand-alone applications and the writing of applets designed for use within web pages. Credits for this course may not be applied to the major in computer and information studies. No more than one of the courses numbered CSC 140 through CSC149 may be counted for degree credits. Not open to students who have received credits for CSC 201J or CSC 202J.
Prerequisites: High school Algebra I & II.

CSC 181 Fluency in Information Technology   3 credits DII

This course develops information technology fluency through concepts, capabilities, and skills to enable students to continuously adapt to the rapid changes in information technology. Students will develop these capabilities through completion of a series of theoretical and applied projects. This course assumes basic computer literacy, including basic computer skills, word processing spreadsheets, presentation graphics, the Internet, and electronic mail. This course may not be used to satisfy the Computer Literacy basic skills requirement.
Prerequisites: Basic computer literacy (as stated above).

CSC 190 Preprogramming   3 credits DII

An introduction to the skills needed for computer programming. Topics include problem-solving methods, software development strategies such as top-down and bottom-up design, and how to read, modify and develop simple algorithms. Algorithms will be implemented in a user-friendly environment such as Karel the Robot, Object Logo and/or Hypercard. Three lecture hours per week, plus laboratory work outside of class. Not open to students who have received credits for CSC 201. Credits for this course may not be applied to the major or minor in Computer Studies.
Note: This course may not be used to satisfy the Computer Literacy core requirement.
Prerequisites: High school Algebra I and II.

CSC 200A Survey of Computer Science I   3 credits DII

This course provides an overview of several fundamental areas within the field of Computer Science, introducing basic vocabulary, central concepts, and typical applications. The areas surveyed include computer hardware, computer arithmetic, operating systems, programming constructs, programming languages, information storage and retrieval, databases, artificial intelligence, and the social context of computing. The course satisfies the Computer Literacy Competency-Based Skills requirement. Not open to students who have received credits for CSC 200.
Prerequisites: Fulfillment of the Basic Mathematics Competency-Based Skills requirement and ability to use standard computer software (e.g., operating system features, word processing, e-mail and web browsers).

CSC 201J Software Design and Programming I   4 credits DII

This course introduces a set of fundamental design principles and problem-solving techniques for the development of computer algorithms and their implementation as programs. Problem solutions are developed with the help of an appropriate modeling language and then coded in an object-oriented programming language. (Consult the computer science department for the languages and tools currently in use.) Topics such as problem specification, object-oriented analysis and design, standard data types, control structures, methods and parameter passing, and design for reuse are presented through a study of specific example problems and solutions. Style, documentation, solution robustness, and conformance with specifications are emphasized throughout. Three lecture hours and three hours of scheduled laboratory per week, plus extensive programming work outside of class.
Prerequisites: High school Algebra I & II, experience with a window-based operating system and the use of email and a word processor.

CSC 202J Software Design and Programming II   4 credits
This course extends the treatment of object-oriented methodologies, languages and tools begun in CSC 201J. The emphasis is on the analysis of complex problems, particularly those involving multiple design alternatives, and the use of class libraries. Specific topics include inheritance, polymorphism, recursion, stream and file I/O exceptions, and graphical interface programming. Style, documentation, solution robustness, and conformance with specifications are emphasized throughout. Three lecture hours per week and three hours of scheduled laboratory per week, plus extensive programming work outside of class.
Prerequisite: CSC 201J with a grade of C+ or higher.

CSC 215 Survey of Computer Science II   4 credits
This course builds on CSC 200/200A and provides an overview of selected Computer Science topics that are more technical or more advanced than those discussed in the earlier course. Topics include a detailed discussion of the binary, octal, and hexadecimal numeration systems, the machine representation of data and instructions, the design of a typical computer chip, programming in a simplified machine language, and such application areas as robots and embedded systems (programming and construction), artificial intelligence, computability theory and Turing machines, and an introduction to networks, including the Internet model. Four lecture hours per week plus laboratory work outside of class.
Prerequisites: A grade of C+ or better in CSC 200 or CSC 200A, CSC 201J.

CSC 221 Theory of Computer Graphics   3 credits
This course deals with the design and production of computer graphics software from both theoretical and practical standpoints. Technical problems related to image production will be treated. Emphasis will be placed on the development of analytic abilities and program design and implementation skills using the graphics features of contemporary languages. Various programming languages will be used. Three lecture hours per week, plus laboratory work outside of class.
Prerequisites: CSC 202J, MAT 220.

CSC 230 Real-Time Computer Interfaces   3 credits
This course deals with the technical aspects of using a computer to sense data from a real world environment and subsequently to control conditions in that environment. The techniques of breadboarding and experimental electronic circuit construction will be used in the laboratory. The construction and interfacing of robotic devices which sense and react to real-world conditions will be emphasized. Three lecture hours per week plus laboratory work outside of class.
Prerequisites: CSC 202J, PHS 205.

**CSC 245A Computer Applications in Science
and Mathematics   4 credits**
Techniques of numerical analysis (solution of equations, interpolation, regression, numerical solution of differential equations) are implemented on the computer and applied to problems selected from physics, chemistry, astronomy, and other sciences. The course includes an introduction to FORTRAN90, stressing its computational and mathematical features. Three lecture hours and two hours of scheduled laboratory per week, plus programming work outside of class. Not open to students who have received credits for CSC 245.
Prerequisites: CSC 202 or CSC 202J, MAT 221.

CSC 260 Data Structures and Algorithms   4 credits
Basic data structures such as stacks, queues, linked lists, and trees are studied and applied to problems in data storage and manipulation. Applications include basic searching and sorting algorithms. Design, analysis and implementation techniques are discussed. Three lecture hours and three hours of scheduled laboratory per week, plus extensive programming work outside of class.
Prerequisites: CSC 202J with grade of C+ or higher; CSC 200A.

CSC 263 Database Systems   4 credits
This course is an in-depth study of the underlying principles of database systems. Topics include data modeling and reduction, physical representations of data and access paths, and the semantics and theory of several major approaches to database organization, including relational and network. Extensive discussion of query generation and optimization is included for at least one database system. Three lecture hours and three hours of scheduled laboratory per week, plus programming work outside of class. Not open to students who have received credits for CSC 405.
Prerequisite: CSC 260.

CSC 266 Software Engineering   4 credits
This course will explore in detail the software development process for large software systems using modern software engineering principles. Topics include: software life cycle models, tools and techniques for software engineering, the software development life cycle, testing/evaluation techniques, and evaluation metrics. An ongoing group design project will be used to gain practical experience with course topics and CASE tools. Three lecture hours and three hours of scheduled laboratory per week, plus programming work outside of class. Not open to students who have received credits for CSC 265.
Prerequisite: CSC 260.

CSC 267 Internship in Computer Science   1-6 credits
This course provides an opportunity for broadening and augmenting a student's computer knowledge through placement in an organization or agency engaged in work directly related to a Computer Science student's academic interests. The number of credits will vary with the nature of the work and the time commitment involved. A student must meet Departmental requirements before registering for the course. Limited to Computer and Information Studies majors. Free elective credits only. This course may be repeated for credits, but the total number Internship credits may not exceed 6.
Prerequisites: CSC 260 and permission of the Department Chairperson.

CSC 271 Introduction to Computer Systems   4 credits
The important concepts of a complete large computer system are introduced, including the machine and assembly language, the low-level use of a standard environment and its implementation language. They are firmly interlinked by studying the methodologies of low-level program control and debugging of assembler and implementation language code under the standard environment, the assembly code generated by compilers, and the overall environment. Three lecture hours and three hours of scheduled laboratory per week, plus extensive laboratory work outside of class.
Prerequisite: CSC 260.

CSC 273 Advanced Applications of C   4 credits
This course presents the C programming language, with emphasis on its particular strengths and special features, including the rich variety of data types and operators, pointers, and bit manipulation. Programming assignments will highlight applications for which the special capabilities of C are particularly well suited, such as systems programming, text processing, computer graphics, and real-time control. Three lecture hours and two hours of scheduled laboratory per week, plus extensive programming work outside of class.
Prerequisite: CSC 260.

CSC 280 Operating System Principles   3 credits
This course presents the evolution of computer operating systems, operating system functionalities, and current design and implementation techniques. Relationships between the operating system, computer architecture, and the user community are discussed. Three lecture hours per week.
Prerequisite: CSC 260.

Computer Science

Computer Science

CSC 290 Theory of Computation **3 credits**
This course introduces the basic concepts underlying the theoretical study of computing and computers: formal languages, automata, Turing machines, computability, and computational complexity. Three lecture hours per week.
Prerequisites: CSC 260, MAT 214A.

CSC 295 Computer Architecture and Organization **3 credits**
This course examines the basic principles of computer systems and how these concepts relate to the design of such systems. Both hardware and software concepts and the interdependence between them are dealt with. The determination of basic tradeoffs and the related decisions are covered. Logic level designs, data representations, computer circuits, fundamental computer operations, program creation, I/O programming, processing elements, links and interfaces, memory hierarchy, and memory management are covered.
Prerequisites: CSC 202J with grade of C+ or higher; CSC 215.

CSC 311 Object-Orientation and Problem Solving Strategies **4 credits**
This course presents a basic treatment of the use of toolkits, frameworks, and design patterns in object-oriented design and programming. The concepts of composition, component reuse, inheritance, and parameterization (templates) are studied and used to develop problem-solving strategies, which are then implemented in one or more current object-oriented languages. (Consult the instructor for the language(s) to be used.) Three lecture hours and two hours of scheduled laboratory per week, plus extensive programming work outside of class.
Prerequisite: CSC 260 with grade of C+ or higher.

CSC 312A Human-Computer Interfaces **4 credits**
This course presents the fundamentals of computer/user interfaces using windows frameworks and object-oriented programming concepts. The basic concepts of a user interface, including command-based, graphical, and multimedia interfaces, are covered in a manner independent of specific technologies. A modern window-based interface implementation is then introduced through the use of one or more current object-oriented programming languages and object interface libraries. (Consult the instructor for the language(s) and libraries to be used.) Three lecture hours and three hours of scheduled laboratory per week, plus programming work outside of class. Not open to students who have received credits for CSC 312.
Prerequisite: CSC 260.

CSC 315A Principles of Data Communications **4 credits**
This course examines the basics of data communications. Modulation techniques, multiplexing, transmission media, error control techniques, message formatting, and packet-switching are treated. Various communication protocols, switching techniques, private branch exchange, networking and internetworking are covered. Three lecture hours and three hours of scheduled laboratory per week, plus programming work outside of class. Not open to students who have received credits for CSC 315.
Prerequisite: CSC 260 with grade of C+ or higher.

CSC 320 Advanced File Structures **4 credits**
This course will elaborate on basic data structures and access algorithms as they pertain to data stored on disk, and will present additional algorithms pertinent to the problem of rapid data storage/retrieval when information is stored on a persistent-storage device. Attention will be paid to implementation considerations and space/time tradeoffs and to the choice of appropriate structures for the solution of typical problems. Three lecture hours and three hours of scheduled laboratory per week, plus extensive programming work outside of class.
Prerequisite: CSC 260 with grade of C+ or higher.

CSC 325 Advanced Programming Techniques **4 credits**
Techniques of searching, sorting, pattern matching, simulation and modeling, and numeric computation are presented and illustrated by applications to such areas as multiple-precision arithmetic, simulation of real-time processes, text and language processors, memory management, and scheduling. Three lecture hours per week, plus extensive laboratory work outside of class.
Prerequisite: CSC 260 with grade of C+ or higher.

CSC 330A Microcomputing Systems **4 credits**
The technology and functions of the microprocessor chip are discussed. Several different architectures are compared. Control functions, real-time techniques, interrupt processing, multiprocessing, and input/output operations are discussed from the microprocessor point of view. The role of high-level programming languages in microcomputer systems is treated. One or more specific microcomputer instruction sets will be used for programming assignments. Three lecture hours and two hours of scheduled laboratory per week. Not open to students who have received credits for CSC 330.
Prerequisites: CSC 295; recommended prerequisite or co-requisite, CSC 260.

CSC 340 Artificial Intelligence **3 credits**
This course studies the theory and application techniques which allow a computer to "behave intelligently". Various operational definitions of intelligence are discussed, along with the concept of "mechanized intelligence". The course includes case studies of expert systems which solve engineering design problems, diagnose disease, and learn from their environment via natural language and/or visual interaction with a user. The role of planning, goal formation, search analysis and evaluation and various forms of representation will be discussed. Three lecture hours per week.
Prerequisites: CSC 260; PHL 325 also recommended.

CSC 390 Compiler Construction **4 credits**
The fundamental problems in the design and implementation of programming language processors are studied. Language syntax and semantics, parsing, implementation techniques such as recursive descent and backtracking, code generation, optimization, and error diagnostics are covered. Concepts are illustrated through extensive programming assignments. Three lecture hours and three hours of scheduled laboratory per week, plus programming work outside of class.
Prerequisite: CSC 260.

CSC 410 Topics in Artificial Intelligence **3 credits**
An in-depth study of selected topics in Artificial Intelligence. Students will study two or three specific areas via readings, use of existing AI programming systems, term papers and/or the implementation of a simple AI project. The topics will vary from semester to semester; see instructor for further information. Three lecture hours per week.
Prerequisite: CSC 340.

CSC 415 Analysis of Algorithms **3 credits**
Advanced concepts from data structures and general algorithms are discussed from both theoretical and applied viewpoints. Topics include: multi-lists, graph theory, searching and sorting algorithms, and general n-way tree structures. Techniques for analysis of algorithms for average and best/worst cases are presented. Laboratory work may involve programming in a high-level structured language. Three lecture hours per week.
Prerequisites: CSC 260, MAT 220, and at least one of the following: CSC 311, CSC 320, CSC 325, CSC 340, or CSC 390.

CSC 430 Topics in Computer Science   3 credits
This course is used for the exploration of advanced aspects of computer science. Course content variable. Course may be repeated for credits with permission of the Department Chairperson.
Prerequisite: CSC 260; other prerequisites variable, depending on topic.

CSC 445 Parallel Processing   4 credits
This course deals with the hardware and software aspects of multiprocessor systems (two or more processors in use simultaneously). The reasons for using such systems, including processor speed limitations and non-uniform capabilities of processors or computers, are examined. Basic hardware concepts such as machine models, parallel programs, networks, and performance and scalability are discussed. Relevant compiler and operating system concepts, programming models, and program development methodologies are introduced. Three lecture hours and one scheduled laboratory hour per week, plus additional laboratory work outside of class.
Prerequisite: CSC 260.

**CSC 498 Project Specification and
Design Practicum   1 credit**
The practicum sets up a typical environment for the development of a detailed proposal for a software-system or hardware-system project. The instructor will assist each student in choosing an appropriate project topic and in refining the proposal through all stages from initial outline to final formal specification. The completed proposal will serve as the contract for the CSC 500 Directed Studies project. Course involves periodic meetings, group discussions, and individual conferences. A presentation of the completed proposal will be made to Computer Science faculty and students. The practicum is graded on a Pass/Fail basis and is taught on a Directed Study basis.
Prerequisites: CSC 266, plus permission of the Department Chairperson.

CSC 500 Directed Study in Computer Science I   3 credits
A substantial project involving design and implementation is carried out on an individual or group basis under the supervision of a faculty member. The specification for the project must have been completed in the prerequisite course CSC 498. A presentation of the completed project will be made to Computer Science faculty and students. Open only to majors in Computer and Information Studies.
Prerequisites: CSC 498. Other prerequisites will vary with the project, and are at the discretion of the faculty supervisor for that project.

CSC 501 Directed Study in Computer Science II   3 credits

Computer Science