The department offers courses covering a wide range of topics in computer science, including programming and programming languages, data structures and algorithms, assembly language, computer architecture, networking, operating systems, compilers, software engineering, file structures, database systems, graphics, artificial intelligence, and theory of computation.

The department seeks to prepare students both for careers in the computing industry and for advanced study in computer science. The department maintains close ties with local computing industries, and encourages its students to participate in the many cooperative and internship opportunities made available through these contacts.

General Information

The B.S. in Computer Science program is accredited by the Computing Accreditation Commission of ABET, http://www.abet.org.

Admission Requirements

Students seeking a degree in computer science must apply to the department for admission to the program. Upon admission the student will be assigned an advisor.

Degree Requirements

Major in Computer Science

Requirements for the B.S. degree in computer science include the core computer science and mathematics courses and upper-level electives selected from computer science.

Minor in Computer Science

The minor in computer science requires:
CPSC 1375 Programming I
CPSC 1175 Introduction to Computer Science Laboratory
CPSC 2376 Programming II
or CPSC 2377 Introduction to Game Programming
CPSC 2380 Data Structures and Algorithms
CPSC 2382 Introduction to Computer Systems and Assembly Language
CPSC 3380 Operating Systems
or CPSC 3370 Net-centric Computing: Systems Concepts
MATH 1451 Calculus I
and MATH 1452 Calculus II
or MATH 1311 Applied Calculus I
and MATH 1312 Applied Calculus II
One three-hour upper-level computer science course

Associate of Science in Computer Programming

The associate of science degree in computer programming requires at least 60 hours including the core computer science courses and approved electives selected from computer science, mathematics, statistics, accounting, management, and engineering technology. Approved electives are chosen via consultation with a Departmental advisor.

Approved Electives (23 hours)

Approved electives are chosen in consultation with a Departmental advisor.

Associate of Science Curriculum

Freshman Year
RHET 1311 Composition I

Sophomore Year

RHET 1312 Composition II
SPCH 1300 Speech Communication
HIST 2311 U.S. History to 1877
or HIST 2312 U.S. History since 1877
or POLS 1310 American National Government
MATH 1302 College Algebra
MATH 1303 Trigonometry
CPSC 1375 Programming I
CPSC 1175 Introduction to Computer Science Laboratory
CPSC 1310 Internet Technologies
Approved electives (8 hours)

Bachelor of Science in Computer Science

General: 120 total hours, including 45 hours of upper-level courses (3000-4000 level), and 30 hours in residence

First-Year Colloquium (1 hour)

Required of full-time freshmen entering college for the first time and transfer students with less than 12 hours of credit. (See page 19 for details)

CPSC 1105 First Year Experience for Computer Science Majors

Core (29 hours)

Composition/Communication (9 hours)
RHET 1311 Composition I
Major Requirements (35 hours):
CPSC 1175 Introduction to Computer Science Laboratory
CPSC 1375 Programming I
CPSC 2376 Programming II
CPSC 2380 Data Structures and Algorithms
CPSC 2382 Introduction to Computer Systems and Assembly Language
CPSC 3380 Operating Systems
CPSC 3383 Language Structure
CPSC 3375 Database Concepts I
CPSC 3482 Computer Organization I
CPSC 4373 Fundamentals of Software Engineering
CPSC 4392 Capstone Project
IFSC 1310 Internet Technologies
IFSC 2200 Ethics in the Profession (Hours included in core)

Electives (9 hours):
Upper-level Computer Science courses with advisor approval

Minor (6-29 hours—typical minor requires 18)
Unrestricted General Electives
Remaining hours, if any, to reach 120 minimum total hours,
45 hours of upper-level courses (3000-4000 level), or 30 hours
in residence.

Bachelor of Science in Computer Science Curriculum (120 hours)

First Semester, Fall (15 hours)
RHET 1311 Composition I
MATH 1451 Calculus I
HIST 1311 History of Civilization I
or HIST 1312 History of Civilization II
CPSC 1375 Programming I
CPSC 1175 Introduction to Computer Science Laboratory
CPSC/IFSC 1105 Freshman Experience

Second Semester, Spring (16 hours)
RHET 1312 Composition II
MATH 1452 Calculus I
CPSC 1310 Internet Technologies
CPSC 2376 Programming II
or CPSC 2377 Introduction to Game Programming
SPCH 1300 Speech Communication

Third Semester, Fall (16 hours)
MATH 2310 Discrete Mathematics
CPSC 2382 Introduction to Computer Systems and Assembly Language
CPSC 2380 Data Structures and Algorithms
PHYS 2321 Physics for Scientists and Engineers I
PHYS 2121 Physics for Scientists and Engineers I Laboratory
HIST 2311 U.S. History to 1877
or HIST 2312 U.S. History since 1877
or POLS 1310 American National Government

Fourth Semester, Spring (15 hours)
Minor course (3 hours)
CPSC 3380 Operating Systems
CPSC 3375 Database Concepts I
PHYS 2322 Physics for Scientists and Engineers II

Technical Writing (3 hours)
RHET 3326 Technical Writing

Major (64 hours)

Additional Math courses (17 hours):
MATH 1451 Calculus I
MATH 1452 Calculus II
MATH 2310 Discrete Mathematics
MATH 3310 Algebraic Structures
or MATH 3312 Linear Algebra
STAT 3352 Applied Statistics

Additional Science Courses (12 hours):
PHYS 2321 Physics for Scientists and Engineers I and
PHYS 2121 Physics for Scientists and Engineers I Laboratory
PHYS 2322 Physics for Scientists and Engineers II and
PHYS 2122 Physics for Scientists and Engineers II Laboratory
or CHEM 1402 General Chemistry I and
CHEM 1403 General Chemistry II
and Technical science course with laboratory

Additional Math/Science Elective (3 hours)
A minimum of 3 additional hours of mathematics or
science courses for majors must be taken in addition to the
requirements listed above.
PHYS 2122 Physics for Scientists and Engineers II Laboratory
IFSC 2200 Ethics in the Profession

Fifth Semester, Fall (16 hours)
- Fine Arts/Humanities core requirement (3 hours)
- CPSC 3383 Language Structure
- CPSC 3482 Computer Organization I
- MATH 3310 Algebraic Structures I
  or MATH 3312 Linear Algebra
- Minor Course (3 hours)

Sixth Semester, Spring (15 hours)
- RHET 3326 Technical Writing
- Social Sciences core requirement (3 hours)
- Upper-level CPSC elective (3 hours)
- Math/Science Elective (3 hours)
- Upper-level humanities core requirement (3 hours)

Seventh Semester, Fall (15 hours)
- CPSC 4373 Fundamentals of Software Engineering
- Unrestricted Elective (2 hours)
- Upper-level CPSC elective (3 hours)
- STAT 3352 Applied Statistics I
- Technical science course with lab (4 hours)

Eighth Semester, Spring (12 hours)
- Upper-level CPSC elective (3 hours)
- CPSC 4392 Capstone Project
- Upper-level Minor courses (6 hours)

Bachelor of Science in Computer Science—GAME

General: 120 total hours, including 45 hours of upper-level courses (3000-4000 level), and 30 hours in residence

First-Year Colloquium (1 hour)
- Required of full-time freshmen entering college for the first time and transfer students with less than 12 hours of credit. (See page 36 for details)
- CPSC 1105 First Year Experience for Computer Science Majors

Core (29 hours)
- Composition/Communication (9 hours)
  - RHET 1311 Composition I
  - RHET 1312 Composition II
  - SPCH 1300 Speech Communication
- Fine Arts/Humanities (5 Hours)
  - IFSC 2200 Ethics in the Profession
- And choose one of the following:
  - MUHL 2305 Introduction to Music
  - ARHA 2305 Introduction to Visual Art
  - THEA 2305 Introduction to Theatre and Dance
  - ENGL 2337 World Literature
  - ENGL 2338 World Literature Themes
  - PHIL 2320 Ethics and Society
- Social Sciences (9 Hours)
  - Choose one of the following:
    - POLS 1310 American National Government
    - HIST 2311 U.S. History to 1877
    - HIST 2312 U.S. History since 1877

And choose one of the following:
- ANTH 2316 Cultural Anthropology
- CRJU 2300 Introduction to Criminal Justice
- ECON 2301 Survey of Economics
- GEOG 2312 Cultural Geography
- GNST 2300 Introduction to Gender Studies
- MCOM 2330 Mass Media and Society
- POLS 2301 Introduction to Political Science
- PSYC 2300 Psychology and the Human Experience
- RELS 2305 World Religions
- SOCI 2300 Introduction to Sociology

And choose one of the following:
- HIST 1311 History of Civilization I
- HIST 1312 History of Civilization II

Additional Upper-Level Communications, Humanities, Arts, and Social Sciences (3 Hours)
- Specific course selection must be done with the approval of the advisor.

Technical Writing (3 Hours)
- RHET 3326 Technical Writing

Major (90 hours)
- Additional Math courses (17 hours):
  - MATH 1451 Calculus I
  - MATH 1452 Calculus II
  - MATH 2310 Discrete Mathematics
  - MATH 3310 Algebraic Structures
  - or MATH 3312 Linear Algebra
  - STAT 3352 Applied Statistics

- Additional Science Courses (12 hours):
  - PHYS 2321 Physics for Scientists and Engineers I
  - and PHYS 2121 Physics for Scientists and Engineers I Laboratory
  - and PHYS 2322 Physics for Scientists and Engineers II
  - and PHYS 2122 Physics for Scientists and Engineers II Laboratory
  - or CHEM 1402 General Chemistry I
  - and CHEM 1403 General Chemistry I
  - AND Technical science course with laboratory

- Additional Math/Science Elective (3 hours)
  - A minimum of 3 additional hours of mathematics or science courses for majors must be taken in addition to the requirements listed above.

Major Requirements (58 hours):
- ARST 1315 Two-Dimensional Design
- ARST 2318 Computer Applications in Art
- ARST 3385 Vector Graphics for Illustrators and Designers
- ARST 3386 Digital Imaging for Illustrators and Designers
- ARST 4348 Web Design
- CPSC 1175 Introduction to Computer Science Laboratory 1
- CPSC 1375 Programming I
- CPSC 2377 Introduction to Game Programming 1
- CPSC 2380 Data Structures and Algorithms 1
- CPSC 2382 Introduction to Computer Systems and Assembly Language
- CPSC 3175 Databases
- CPSC 3482 Computer Organization
- CPSC 3380 Operating Systems
- CPSC 3383 Language Structure
- CPSC 4366 Interactive Computer Graphics and Animation
- CPSC 4373 Fundamentals of Software Engineering
Bachelor of Science in Computer Science Curriculum—GAME Option (120 hours)

First Semester, Fall (15 hours)
CPSC/IFSC 1105 Freshman Experience
CPSC 1175 Introduction to Computer Science Laboratory
CPSC 1375 Programming I
MATH 1451 Calculus I
SPCH 1300 Speech Communication
RHET 1311 Composition I

Second Semester, Spring (16 hours)
ARST 1315 Two-Dimensional Design
CPSC 1310 Internet Technologies
CPSC 2377 Introduction to Game Programming
MATH 1452 Calculus II
RHET 1312 Composition II

Third Semester, Fall (15 hours)
ARST 2318 Computer Applications in Art
CPSC 2380 Data Structures and Algorithms
CPSC 2382 Introduction to Computer Systems and Assembly Language
ECON 2301 Survey of Economics
or PSYC 2301 Psychology and Human Experience
MATH 2310 Discrete Mathematics

Fourth Semester, Spring (15 hours)
CPSC 3375 Databases
HIST 1311 History of Civilization I
or HIST 1312 History of Civilization II
MATH 3312 Linear Algebra
RHET 3326 Technical Writing

Fifth Semester, Fall (16 hours)
CPSC 3383 Language Structure
CPSC 4383 Artificial Intelligence
CPSC 4399 Mobile Applications
HIST 2311 U.S. History to 1877
or HIST 2312 U.S. History since 1877
or POLS 1310 American National Government
PHYS 2321 Physics for Scientists and Engineers I
PHYS 2121 Physics for Scientists and Engineers I Laboratory

Sixth Semester, Spring (16 hours)
ARST 3385 Vector Graphics for Illustrators and Designers
ARST 3386 Digital Imaging for Illustrators and Designers
CPSC 3380 Operating Systems
CPSC 4366 Interactive Computer Graphics and Animation
CPSC 4377 Advanced Game Programming
PHYS 2322 Physics for Scientists and Engineers II
PHYS 2122 Physics for Scientists and Engineers II Laboratory

Seventh Semester, Fall (14 hours)
ARST 3385 Vector Graphics for Illustrators and Designers
CPSC 3482 Computer Organization
CPSC 4373 Fundamentals of Software Engineering
IFSC 2200 Ethics in the Profession
Core Fine Arts/Humanities Elective (3 hours)

Eighth Semester, Spring (13 hours)
ARST 4348 Web Design
CPSC 4392 Capstone Project
Math / Science Upper-Level (3000-4000) Elective (3 hours)
Core Technical Science with Lab (4 hours)

Information Assurance
The minor and technical certificate program in information assurance (IA) is designed to provide students with the knowledge and capacity to implement information security and to solve IA problems. The program goals are to heighten awareness of IA in the academic community, prepare graduates who are capable of evaluating IA situations, and contribute to finding appropriate solutions to IA problems.

For students who currently hold degrees in areas other than IA, the program provides the environment to develop their knowledge and capacity for implementing information security and to do research in the area. It will also benefit students who wish to supplement their educations with knowledge of how to evaluate and improve the security of data from both technical and social perspectives.

Minor in Information Assurance

The IA minor is not limited to students in the Donaghey College of Engineering and Information Technology (EIT). In addition to students in computer-related programs such as Computer Science, Information Science, or Systems Engineering, the minor is also designed to include those with interests in Criminal Justice or Business Management who may not have extensive backgrounds in computers, math, or technology.

Technical Certificate in Information Assurance

Students or working professionals who may or may not already have an undergraduate or graduate degree may elect to earn a Technical Certificate in Information Assurance. The technical certificate program is provided by the Department of Computer Science; contact the department chairperson for current information. The requirements for certification are the same as the minor program. Note: This graded certificate does not replace traditional certification programs such as the Certified Information Systems Security Professional (CISSP) certification.

Minor and/or Certificate in Information Assurance

The IA Minor and Technical Certificate in Information Assurance consist of 20 hours in seven courses. All courses must be completed with a grade of C or greater.

Students matriculating through colleges other than EIT must obtain written consent from the instructors before enrolling in a course offered by EIT.
Minor in Information Assurance Curriculum

Required Prerequisite (3 hours)
IFAS 2300 Introduction to Information Assurance

Core Courses (8 hours)
CRJU 3309 Cyber Crime and the Law
IFAS 3300 Computer Forensics
IFSC 2200 Ethics in the Profession

Computer Networking Course (3 hours)
MGMT 4310 Network Technologies
IFSC 3315 Applied Networking
CPSC 4384 Computer Networks
or CPSC 3370 Net-centric Computing: Systems Concepts
SYEN 3332 Communication Networks

Database Course (3 hours)
MGMT 4350 Business Data Management
IFSC 3320 Database Concepts
CPSC 3375 Database Concepts I
SYEN 3360 Data Communications

Approved Elective (3 hours)
SYEN 3318 Decision and Risk Analysis
MGMT 4311 Security Issues and Advanced Topics in Network Technologies
IFSC 4339 Network Security
IFSC 4330 Database Security
CPSC 3380 Operating Systems
or CPSC 3370 Net-centric Computing: Systems Concepts
CPSC 4376 Applied Cryptography

Bachelor of Professional Studies in Information Assurance

General: 120 total hours, including 45 hours of upper-level courses (3000-4000 level), and 30 hours in residence

First-Year Colloquium (1 hour)
Required of full-time freshmen entering college for the first time and transfer students with less than 12 hours of credit. (See page 19 for details)
IFSC 1105 First Year Experience for Information Science Majors

Standard Core (21 hours)
See Catalog for Description of Standard Core Course Options

EIT College Core (14 hours)

Major (hours)
Professional Foundation Courses (15 hours required of all BPS degrees that are maintained by the BPS Curriculum Committee)
Note: The course numbers in parenthesis are the pre-requisite course requirements (e.g., MGMT 3340 below has a pre-requisite of MGMT 3300)

Applied Organizational Administration and Behaviors
MGMT 3340 Managing People in Organizations (MGMT 3300)
MGMT 3320 Human Resources Management (None)
Organizational Systems
MGMT 3300 Principles of Management (None)

Communications
SPCH 3330 Professional Communication (SPCH 1300)
RHET 3316 Writing for the Workplace (RHET 1312)

Professional Core Electives (Select 6 hours from a list of electives maintained by the BPS Curriculum Committee)
ITEC 3610 Introduction to Information Technology and Applications (None)
PSYC 3370 Industrial Psychology (PSYC 2300)
PSYC 4325 Personnel Psychology (PSYC 2300)
PSYC 4363 Organizational Psychology (PSYC 2300)
RHET 3301 Editing for Use and Style (RHET 1311 and RHET 1312)
RHET 3315 Persuasive Writing (RHET 1312)
SPCH 3340 Communication Ethics for the Professional (SPCH 1300)
SPCH 3320 Advanced Public Speaking (SPCH 1300)
SOC 3334 Social Problems (SOC 2300)
SOC 3330 Racial and Minority Groups (SOC 2300)
SOC 4365 Sociology of Organizations (SOC 2300)

Concentration (Minimum of 18 hours developed and maintained by the departmental faculty administering the concentration)
CPSC 1175 Introduction to Computer Science Laboratory (co-req with CPSC 1375)
CPSC 1375 Programming I
IFAS 2300 Introduction to Information Assurance
IFAS 3300 Computer Forensics
CPSC 2376 Programming II
or CPSC 2377 Introduction to Game Programming
CPSC 2380 Data Structures and Algorithms
CPSC 2382 Introduction to Computer Systems and Assembly Language
CPSC 3370 Net-Centric Computing: Systems Concepts
CPSC 4360 Computer Security
CRJU 3309 Cyber Crime and the Law

Concentration Electives (Additional coursework related to the concentration to bring the total number of hours in the concentration to 48)

Concentration electives may be chosen from the recommended list below:
MATH 1311 Applied Calculus I
or MATH 1451 Calculus I
or equivalent
MATH 2310 Discrete Mathematics
IFSC 2200 Ethics in the Profession
STAT 3352 Applied Statistics I
CPSC 4376 Applied Cryptography
Other appropriate courses identified by the academic advisor

Minor (none required)

Unrestricted General Electives
Remaining hours, if any, to reach 120 minimum total hours, 45 hours of upper-level courses (3000-4000 level), and /or 30 hours in residence.
Courses in Information Assurance (IFAS)

IFAS 2300 Introduction to Information Assurance
Prerequisite: RHET 1312. Study of information security for roles as security professionals and business decision-makers. This course addresses knowledge areas of the Certified Information Systems Security Professional (CISSP) certification, including need for security, legal and ethical issues, risk management, security technologies and tools, and personnel security maintenance. Three hours lecture. Three credit hours.

IFAS 3300 Computer Forensics
Prerequisite: IFAS 2300 and knowledge of Unix or Linux, as well as Windows operating systems. Study of the preservation, identification extraction, documentation, and interpretation of computer data following clear, well-defined methodologies and procedures. This course can be repeated for credit with a different theme. Three hours lecture. Three credit hours.

Courses in Computer Science

CPSC 1105 First Year Experience for CPSC/IFSC Majors
A survey of the Computer and Information Science majors with coverage of Interpersonal and Team Communication skills, Time Management & Goal Setting, Techniques for Discovering, Organizing & Presenting Information, Self-Initiated Learning, and Overview of Campus-based resources. Activities include service learning projects, field trips, guest speakers, demonstrations, faculty presentations, and social networks. Two hour lab per week. One credit hours.

CPSC 1175 Introduction to Computer Science Laboratory
Prerequisite: MATH 1302 or equivalent. Corequisite: CPSC 1375. A laboratory course to accompany CPSC 1375. Introduction to editing, compiling, and executing programs on various platforms; UNIX operating system; number systems and number conversions; presentation software, and the Internet resources. Successful completion of this course requires a grade of C or greater. Two hours laboratory per week. One credit hour.

CPSC 1310 Internet Technologies
See IFSC 1310. Internet Technologies.

CPSC 1370 Computer Literacy
The fundamental concepts of computing in a personal computer environment. Introduction to hardware and software and system configurations. The focus is on practical problem solving using popular PC application software for word processing, spreadsheets, and databases. This course may not be counted for credit toward a computer science major or minor. Three hours lecture per week. Three credit hours. (ACTS Course Number CPSI 1003)

CPSC 1372 RPG Programming
Prerequisite: CPSC 1375, MGMT 1310, or equivalent. Report Program Generator is a nonprocedural language for data processing. Input, output, arithmetic, comparison, control breaks, arrays, sequential files, direct-access files. This course may not be counted for credit toward a computer science major or minor. Three hours lecture per week. Three credit hours.

CPSC 1375 Programming I
Prerequisite: MATH 1302 or equivalent. Corequisite: CPSC 1175. Introduction to algorithm development and implementation using control structures, functions, arrays, pointers, and basic object-oriented concepts. Successful completion of this course requires a grade of C or greater. Three hours lecture per week. Three credit hours.

CPSC 2376 Programming II
Prerequisite: CPSC 1375. Advanced programming concepts including structures, abstract data types, details of object-oriented concepts including encapsulation and polymorphism in current object-oriented language. Successful completion of this course requires a grade of C or greater. Three hours lecture per week. Three credit hours.

CPSC 2377 Introduction to Game Programming
Prerequisites: CPSC 1375, IFSC 2300 SYEN 1302. Advanced programming concepts including structures, abstract data types, recursive techniques, game based hands-on experiences for students to learn and understand details of advanced object-oriented concepts in a current object-oriented language. Successful completion of this course requires a grade of C or greater. Three hours lecture per week. Three credit hours.

CPSC 2380 Data Structures and Algorithms
Prerequisite: CPSC 2376 or CPSC 2377. A systematic study of the main data structures of computer science: arrays, stacks, queues, linked lists, trees, graphs, hash tables. Implementation and analysis of the algorithms and programming techniques for searching sorting, inserting into, and deleting from these structures; efficiency considerations. Successful completion of this course requires a grade of C or greater. Three hours lecture per week. Three credit hours.

CPSC 2382 Introduction to Computer Systems and Assembly Language
Prerequisite: CPSC 1375 or equivalent. Introduction to machine architecture, detailed study of the PC instruction set and addressing modes. Assembling, linking, executing, and debugging of assembly language programs. Additional topics include keyboard and screen handling, string processing, interrupts, binary and decimal arithmetic. Three hours lecture per week. Three credit hours.

CPSC 2391 Cooperative Education
Prerequisites: major in computer science, CPSC 2376 or CPSC 2377, and consent of department chairperson. Designed to complement and extend the classroom learning experience through the application of theoretical concepts in a professional work environment. A minimum of 200 hours of work with a participating employer. The exact number of work hours, activities, and responsibilities are dependent on the nature of the work experience and must be specified in written agreements coordinated with the Office of Cooperative Education. Three credit hours.

CPSC 2399 Special Topics
Prerequisite: CPSC 1370, 1375, or equivalent or the consent of the instructor. Introduction to a programming language to be selected from the following list: Visual BASIC, C, ADA, Perl, XML, scripting languages, Internet programming. This course may be repeated with a different language. This course is not accepted for credit in the computer science major or minor. Three hours lecture per week. Three credit hours.

CPSC 3370 Net-centric Computing: Systems Concepts
Prerequisites: CPSC 2380 and CPSC 2382. Coverage of systems programming of net-centric computing systems. Hands-on experiences for students to learn how net-centric computing systems work and writing net-centric computing applications. Three hours lecture per week. Three credit hours.

CPSC 3371 Net-centric Computing: Language Concepts
Prerequisites: CPSC 2380 and CPSC 2382. Coverage of language design issues for net-centric computing systems. Hands-on experiences for students to learn and understand tradeoffs between applicative needs compared to language design and implementation issues. Three hours lecture per week. Three credit hours.
CPSC 3372 System Utilities  
Prerequisite: CPSC 2376 or CPSC 2377. Job shops, file identification, program storage, data storage, cataloged procedures, libraries, utility programs. Three hours lecture. Three credit hours.

CPSC 3375 Database Concepts I  
Prerequisites: CPSC 2380, MATH 2310. In-depth study of data models including E-R, EER, Relational, object relational, and other current models; Data language including relational algebra, relational calculus, SQL, and QBE; Database design including functional dependency and normalization; Database implementation using popular DBMSs; Application development using embedded SQL enhanced by web technology. Three hours lecture per week. Three credit hours.

CPSC 3380 Operating Systems  
Prerequisites: CPSC 2382; MATH 1452 or equivalent. Buffering, physical input/output, and data management. Loaders, linkage editors, and relocation. Multiprogramming, scheduling resource allocation, and virtual memory. Three hours lecture per week. Three credit hours.

CPSC 3381 Enterprise COBOL Application Development  
Prerequisite: CPSC 2376, CPSC 2377, or consent of the instructor. Accelerated programming in COBOL. Includes organization of COBOL programs, input, output, data manipulations, and tables, file organization, and file access methods. Subprogram, introduction to CICS programming. Three hours lecture per week. Three credit hours.

CPSC 3383 Language Structure  
Prerequisites: CPSC 2380; MATH 2310. Concepts of syntax and semantics of grammars and languages. Study and comparison of the organization and major constructs of various programming language paradigms, with in-depth study of several specific languages. Implementation and compiler/interpreter-related issues. Three hours lecture. Three credit hours.

CPSC 3385 File Structures and Multimedia  
Prerequisites: CPSC 2380 and MATH 1452 or equivalent. In-depth study of sequential, indexed, and direct file structure; buffering, indexing; file systems; markup file structures including XML. Modern file representation including image files and sound files; Multimedia technology including CD-ROM, DVDs, and tape storage. Three hours lecture per week. Three credit hours.

CPSC 3386 Information Storage and Retrieval  
Prerequisites: CPSC 2380, MATH 2310, 1452 or equivalent. The analysis of information content by statistical, syntactic, and logical methods. Search and matching techniques. Automatic retrieval systems, question answering systems. Evaluation of retrieval effectiveness. Three hours lecture per week. Three credit hours.

CPSC 3387 Simulation Methods  
Prerequisites: CPSC 2380, STAT 3352 or equivalent, MATH 1452. Introduction to the design and analysis of discrete probabilistic systems using simulation. Basic concepts in modeling and analysis for both continuous and discrete systems are covered. Combined simulation methods, including integrated qualitative/quantitative system modeling. Emphasizes model construction and simulation language. Three hours lecture per week. Three credit hours.

CPSC 3391 Cooperative Education  
Prerequisites: major in computer science, completion of the computer science freshman and sophomore core, and consent of department chairperson. Further work experiences to complement and extend the classroom learning experience through the application of theoretical concepts in a professional work environment. A minimum of 200 hours work with a participating employer. The exact number of work hours, activities, and responsibilities are dependent on the nature of the work experience and must be specified in written agreements coordinated with the Office of Cooperative Education. Three credit hours.

CPSC 3482 Computer Organization I  

CPSC 3490 Computer Security  
Prerequisite: CPSC 3370 or consent of instructor. Junior standing or above. Increasing reliance on our computer-based infrastructure elements along with information-driven nature of today’s business require a solid and in depth understanding of security issues pertinent to the systems. The topics include threats, assumptions, assurance, confidentiality, integrity, availability, access control matrix and policies, security models, requirements imposed by policies, protection models, covert channels, formal methods for security, designing and evaluating systems, intrusion detection, auditing and other contemporary issues. Three hours lecture per week. Three credit hours.

CPSC 4366 Interactive Computer Graphics and Animation  
Prerequisite: MATH 2310 and knowledge of C, C++, or Java programming. This course addresses topics such as introduction to computer graphics and all the details of design of modern graphics architectures. The topics covered include two and three dimensional modeling and transformation, lighting and shading, animation techniques, introduction to OpenGL. Dual-listed in the UALR Graduate Catalog as CPSC 5366. Three hours lecture per week. Three credit hours.

CPSC 4370 Theory of Computation  
Prerequisites: CPSC 3383, MATH 2310. A study of the main areas of theoretical computer science and their hierarchical interconnections. Basic results relating to formal models of computation, with emphasis on grammars and languages, finite automata, Turning machines, and computational complexity. Three hours lecture per week. Three credit hours.

CPSC 4371 Computer Documentation  
Prerequisite: Senior standing in computer science and consent of instructor. The design and development of computer system documentation with emphasis on user documentation. Practical experience in writing a user manual using structured design methodology. Discussion of online documentation, hypertext, and emerging documentation technologies. Three hours lecture per week. Three credit hours.

CPSC 4372 Object-oriented Programming  
Prerequisites: working knowledge of a procedural programming language and UNIX operating system, or consent of the instructor. Concepts of object-oriented analysis, design, and implementation. Object-oriented programming in C++, Smalltalk, Java, and/or another current object-oriented programming language. Dual-listed in the UALR Graduate Catalog as CPSC 5372. Three hours lecture. Three credit hours.

CPSC 4373 Fundamentals of Software Engineering  
Prerequisites: CPSC 3380, CPSC 3383 or equivalent, and MATH 1452. Requirements definition, analysis and modeling including use cases and use case paths, domain models, state transition diagrams; techniques to increase robustness and avoid disastrous defects; object-oriented architecture and design patterns and specifications in UML; performance impact of design choices; analysis of designs regarding maintainability and testability; security engineering; practical system test and glass-box testing fundamentals; verification of test coverage via decision tables and state transition table. Dual-listed in the UALR Graduate Catalog as CPSC 5373. Three hours lecture per week. Three credit hours.
CPSC 4375 Fundamentals of Database Management Systems
Prerequisites: CPSC 3375 or equivalent. Advanced topics related to the design and efficient implementation of modern database management systems. Concurrency and transaction management, database security, query processing, query optimization, physical database storage, and indexing. Dual-listed in the UALR Graduate Catalog as CPSC 5375. Three hours lecture per week. Three credit hours.

CPSC 4376 Applied Cryptography
Prerequisites: CPSC 2380, MATH 2310, and STAT 3352 or equivalents. A survey and study of the major cryptographic techniques, algorithms, and implementations, with emphasis on applications to communications and network security. Intended as a practical introduction to the current state-of-the-art of cryptographic usage. Dual-listed in the UALR Graduate Catalog as CPSC 5376. Three hours lecture. Three credit hours.

CPSC 4377 Advanced Game Programming
Prerequisite: CPSC 2380, Junior/Senior or entry graduate level standing. This course is the third semester of programming and problem solving using the C++ language to develop video games. The course will cover implementation of numerous advanced programming techniques: resource management, graphical interfaces, physics, collision detection and resolution, non-player characters, and media integration. The examples and programming assignments make extensive use of multiple external C++ libraries. The class will also cover select theoretical aspects of game programming and development.

CPSC 4381 Computer Architecture and Design
Prerequisite: CPSC 3482. Formal description of computer architecture and design, instruction set architectures, processor design of modern computers, pipeline and instruction level parallelism, memory system design, and input and output system design. Dual-listed in the UALR Graduate Catalog as CPSC 5381. Three hours lecture per week. Three credit hours.

CPSC 4382 Compiler Construction and Theory
Prerequisites: CPSC 3371. Fundamental principles of compiler design such as finite state machine and context-free grammar. Compilation techniques include compile and run-time symbol tables, lexical analysis, syntax analysis, semantic analysis, object code generation, error diagnostics, and optimization. Dual-listed in the UALR Graduate Catalog as CPSC 5382. Three hours lecture. Three credit hours.

CPSC 4383 Artificial Intelligence
Prerequisites: CPSC 2380; MATH 1452 and MATH 2310, Junior/Senior undergraduate or entry graduate level standing. Introduction to machine intelligence. Emphasis upon different paradigms for problem solving such as various state-space search strategies and other approaches. Exposure to one or more key areas such as robotics, logic programming, machine learning, expert systems, planning, neural networks, natural language processing, reasoning, under uncertainty, etc. Three hours lecture per week. Three credit hours.

CPSC 4384 Computer Networks
Prerequisites: CPSC 3380 and CPSC 3482. Introduction to design and analysis of computer networks. Computer communications architecture and protocols, local and wide area networks, IP networks, bridging and routing, Ethernet, wireless LANs, sockets programming, and distributed applications. Dual-listed in the UALR Graduate Catalog as CPSC 5384. Three credit hours.

CPSC 4387 Distributed Computing
Prerequisites: CPSC 3370. Network-based client/server computing. Topics include TCP/IP, object-oriented technology, distributed objects and their interfaces, JDBC, remote method invocation, CORBA, and web-based software system architecture. Three credit hours.

CPSC 4388 Smart Software Systems
Prerequisite: CPSC 3375, MATH 1452. Study of the concept, design, and implementation of rule-based systems, agent-based systems, reasoning, reasoning under uncertainty; belief systems, explanation systems; knowledge representation, knowledge acquisition, and knowledge discovery; and application of knowledge engineering in web technology. Dual-listed in the UALR Graduate Catalog as CPSC 5388. Three hours lecture per week. Three credit hours.

CPSC 4389 E-commerce: Analysis, Design, and Implementation
Prerequisites: CPSC 3371, 3375. E-commerce site analysis and design. Web-based system architecture, client/server computing, network protocols, software engineering for web based systems, computer networks, web-based databases, script languages (Java, VB), XML, ASP, SQL, and DSN. Three credit hours.

CPSC 4391 Cooperative Education
Prerequisites: major in computer science, CPSC 3391, and consent of department chairperson. Continuation of CPSC 3391. Work experiences to complement and extend the classroom learning experience through the application of theoretical concepts in a professional work environment. A minimum of 200 hours work with a participating employer. The exact number of work hours, activities, and responsibilities are dependent on the nature of the work experience and must be specified in written agreements coordinated with the Office of Cooperative Education. Three credit hours.

CPSC 4392 Capstone Project
Prerequisites: CPSC 3370, CPSC 3371, and CPSC 4373 or IFSC 3360. Capstone course in which student individually design a software system, document and present their conclusions. Students also develop a detailed undergraduate portfolio for a comprehensive review of their undergraduate work. Project work involves the development of design alternatives, development of an appropriate software architecture, and design and test the implemented system. The software design focuses on addressing overall design goals while understanding constraints of cost, etc. Deliverables and schedule are determined by the instructor. Three credit hours.

CPSC 4395, 4495, 4595 Internship
Prerequisites: senior standing in computer science, approval of assignment by advisor. Professional experience related to student’s discipline under supervision of advisor. Sixty hours work per credit hour. Three, four, or five credit hours.

CPSC 4399 Special Topics
Prerequisite: consent of instructor. Advanced topics in areas of current interest in computer science. Refer to the semester schedule for specific topics offered. Dual-listed in the UALR Graduate Catalog as CPSC 5399. Three hours lecture. Three credit hours.

CPSC 4400, 4500, 4600, 4700, 4800 Independent Study
Prerequisites: senior standing, at least 20 hours in computer science, consent of instructor. Designed for students who want to carry out special investigations. Topic and method of procedure must have approval of the supervising faculty member. Dual-listed in the UALR Graduate Catalog at the 5000-level. Sixty hours work per credit hour. One, two, three, four, or five credit hours.