

COMPUTER SCIENCE, B.S./M.S.

Faculty Kamyar Dezhgosa, Mark Lovik, Keith Miller, Ted Mims, Mary Sheila Tracy, Jingyu Zhang

Associated Faculty Burks Oakley II

Degrees offered: Bachelor of Science, Master of Science, Undergraduate Minor

The bachelor of science degree is designed to provide the graduate with a strong foundation in computer science and related disciplines. The degree provides students with experience in mastering problem-solving skills relevant to business, scientific, and public issues.

Graduates of the B.S. program have been successful in earning advanced degrees and in pursuing careers in research and application-oriented positions in business, industry, government, and education. The diversity of course offerings and rigorous degree requirements ensure that B.S. graduates acquire knowledge necessary to shape their career goals.

The master's degree in computer science is oriented toward software and is most appropriate for candidates interested in the design, analysis, and implementation of software programs.

Students have access to an outstanding variety of computing systems including a Sun SPARC 20 file-server, additional UNIX-based computers, transputers

for parallel processing, microcomputers, and a hands-on network configuration laboratory. Computer laboratories are open evenings and weekends and some systems are available 24 hours a day through dial-up access.

Contact: Information about the computer science program is available at (217) 206-6770 and csc.uis.edu/. Information can also be requested at csc@uis.edu.

THE BACHELOR'S DEGREE ADVISING

Before registering for the first time, the student should discuss an appropriate course of study with a member of the faculty. After classes begin, students are urged to choose a permanent adviser as soon as possible.

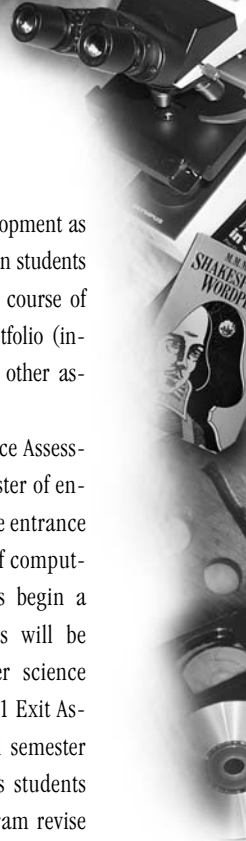
ASSESSMENT

The computer science program assesses all students for communication skills and for knowledge of computer science. Assessment is intended to help students

in their academic planning and their development as computer scientists. Assessment begins when students enter UIS and continues throughout their course of study. It includes an entrance exam, a portfolio (including computer programs, reports, and other assignments), and an exit exam.

The process begins in CSC 300 Entrance Assessment, which must be taken the first semester of enrollment as a computer science major. The entrance assessment is an exam of the core areas of computer science. During this course, students begin a portfolio to which selected assignments will be added from each of the core computer science courses. The process concludes in CSC 301 Exit Assessment, which must be taken the final semester before graduation. Exit assessment helps students assess their progress and helps the program revise the curriculum.

Note: The computer science assessments should not be confused with the university assessment tests. For information about university assessments, see p. 40.



APPLIED STUDY

The computer science program's applied study term is an excellent opportunity for students to gain practical experience. Placements have included state agencies, insurance companies, the SIU School of Medicine, computer companies, and many other locations throughout central Illinois.

ENTRANCE REQUIREMENTS

Formal application to the program is required for admission. Enrollment in CSC 300 Entrance Assessment is required during the first semester. Program entrance requirements include two semesters of programming experience in a high-level language (i.e., Pascal, C, C++, Java). CSC 325 and CSC 375 may be taken at UIS to satisfy this requirement. Entrance requirements also include one semester of calculus as well as discrete math and statistics. MAT 115, MAT 302, and MAT 323 may be taken at UIS to satisfy these requirements; 12 of these hours may be counted toward the degree as general electives. Students considering an advanced degree or a career in a scientific field are strongly encouraged to take a second semester of calculus.

UIS REQUIREMENTS

Students must complete a minimum of 12 semester hours of UIS requirements in the areas of liberal studies colloquia, public affairs colloquia, and applied study. At least four hours must be earned in each of two areas.

DEGREE REQUIREMENTS

The core curriculum provides a strong foundation in computer science. CSC electives are chosen in consultation with the student's adviser to ensure depth of knowledge in topics of particular interest to the student. There are no restrictions for general electives. CSC courses must be taken for a letter grade.

Core Requirements

CSC 300 Entrance Assessment	0 Hrs.
CSC 301 Exit Assessment	0 Hrs.
CSC 376 Computer Organization	4 Hrs.
CSC 385 Data Structures and Algorithms	4 Hrs.
CSC 387 Foundations of Computer Science	4 Hrs.
CSC 388 Programming Languages	4 Hrs.
CSC 389 Introduction to Operating Systems	4 Hrs.
CSC 478 Software Engineering Capstone	<u>4 Hrs.</u>
Total core	24 Hrs.

Other Requirements

CSC Electives	12 Hrs.
General Electives	<u>12 Hrs.</u>
Total Other	24 Hrs.
UIS Requirements	<u>12 Hrs.</u>
Total	60 Hrs.

COMPUTER SCIENCE MINOR

A minor in computer science is designed for students who wish to develop a working knowledge of the computer that will allow them to apply effective computer techniques and computational problem-solving skills in a variety of contexts. It is useful for students with virtually any academic major, including accountancy, business administration, clinical laboratory science, economics, management, and others. A working knowledge of computers allows people to apply computer techniques in their careers and to introduce effective, computer-based methods.

The minor provides a foundation in computer science for non-majors. Appropriate CSC electives are chosen in consultation with a CSC adviser. CSC courses must be taken for a letter grade.

Requirements

MAT 302 Discrete Mathematics	4 Hrs.
------------------------------	--------

CSC 325 Computer Science I	4 Hrs.
CSC 375 Computer Science II	4 Hrs.
CSC Electives	<u>12 Hrs.</u>
Total	24 Hrs.

THE MASTER'S DEGREE

ENTRANCE REQUIREMENTS

Applicants must submit a Graduate Record Exam (GRE) score and a complete set of official undergraduate transcripts signifying graduation from an accredited university. For full admission, a minimum undergraduate grade-point average of 2.70 on a 4.00 scale is required. Students who take the TOEFL exam must achieve a score of 550 or higher. Applicants who do not meet all entrance requirements may be granted conditional admission. This allows a student to complete 12 hours toward the degree. Grades of B- or better must be earned in all courses taken while on conditional admission. Full admission is required before the student can continue beyond 12 hours in the CSC curriculum. Some entrance requirements may be waived for students who can provide evidence of advanced career experience.

PREREQUISITES

Applicants are expected to have completed a program of study similar to that required for a bachelor's degree in computer science. Candidates lacking proper undergraduate background must demonstrate competency by obtaining a minimum grade-point average of 2.70 in specified prerequisite courses. Prerequisite courses may be taken at UIS or equivalent courses may be taken elsewhere. These courses will not count toward the graduate degree and must be completed before full admission is granted.

PREREQUISITE CURRICULUM

(for students without a computer science degree)

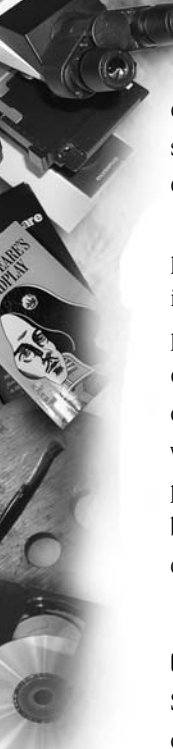
- MAT 302 Discrete Mathematics
- MAT 113 Business Calculus *or*
- MAT 115 Calculus I
- MAT 323 Probability and Statistics for
Computer Science
- CSC 325 Computer Science I
- CSC 375 Computer Science II
- CSC 376 Computer Organization
- CSC 385 Data Structures and Algorithms
- CSC 388 Programming Languages
- CSC 389 Introduction to Operating Systems

DEGREE REQUIREMENTS

Students must complete 32 hours of approved courses; no more than 12 hours may be taken before the student is fully admitted to the program. Course work must include: 1) 24 hours of CSC electives approved by the student's adviser; 12 hours must be at the 500-level; 2) 4 hours of CSC 550 Master's Project/Thesis; and 3) 4 hours from approved public affairs courses (PAD 460 Graduate Public Service Internship Seminar is appropriate).

CLOSURE REQUIREMENTS

Computer science graduate students must complete a comprehensive closure exercise to demonstrate the ability to formulate, investigate, and analyze a problem and to report results in writing and orally. The exercise is classified as either a graduate project or a master's thesis. Both options require significant work. A thesis is an extensive research essay on an approved computer science topic, original in either its content or mode of integration. A project is an applied study that combines an approved computer science topic with actual problems or issues in a professional setting. Completing the closure exercise demonstrates a student's qualifications as a computer professional. Guidelines for completing the re-




quirement are available from the CSC program and should be consulted before any work on the closure exercise is begun.

Students must enroll in four hours of the master's project/thesis course (CSC 550) for credit. If the work is not completed during the initial four hours, campus policy requires that students register to audit one hour of CSC 550 during *each* semester the work remains incomplete. Failure to maintain continuous enrollment will require retroactive registration for one credit hour per semester. If a formal leave of absence is approved by the program, continuous registration is not required.

GRADING POLICY

Students must earn a grade of B- or better in all courses that apply toward the degree. In addition, students who do not maintain a 3.00 grade-point average will be placed on academic probation according to campus policy. Graduate students enrolled in 400-level courses should expect more stringent grading standards and/or additional assignments. Courses taken on a credit/no credit basis will not count toward the degree.

COURSE DESCRIPTIONS

 *Course available online; may also be available on campus. Refer to the current course schedule for further information.*

CSC 300 Entrance Assessment (0 Hrs.)

Evaluation of computer science knowledge on entering the program. CSC 300 must be taken during the student's first semester of enrollment.

CSC 301 Exit Assessment (0 Hrs.)

Evaluation of computer science knowledge on graduation. Exit assessment helps students assess their progress and helps the program revise its curriculum. CSC 301 must be taken during the student's final semester before graduation.

CSC 317 Software Packages (2 Hrs.)

A large part of computing that is being done today is through general programs designed to handle a wide range of general problems rather than through programs designed to solve a specific problem. This course covers these general programs (software packages) from the viewpoint of the task to be performed and how a specific package can be used to accomplish the job. Examples are taken from spreadsheet, database, and the Windows operating system. Considerable time in the computer lab is required.

CSC 318 Computer Literacy (4 Hrs.)

Introduction to computers for personal and professional use. A course of general interest, giving experience with

personal computer software including word processing, spreadsheet, database, and electronic communication applications; information retrieval from the Internet; and fundamental computer literacy. Considerable time in computer lab is required.

CSC 319 Computer Programming (4 Hrs.)

An introduction to structured programming. Emphasis on control structures, simple data types including arrays, and creating simple Windows applications. Assigned problems require considerable time in the computer lab. For students who do not intend to major in computer science. Prerequisite: CSC 318, or equivalent computer experience with Windows applications.

CSC 325 Computer Science I (4 Hrs.)

Structured programming techniques. Emphasis on control structures, procedures, simple data types, and structured data types, including arrays, records, and files. Assigned problems require considerable time in the computer lab. Prior programming experience is recommended.

CSC 375 Computer Science II (4 Hrs.)

Extensive top-down design principles to solve non-trivial problems. Emphasis on advanced array applications, dynamic storage, and classes. Programming assignments include implementation of lists, stacks, queues, and recursions. Prerequisite: CSC 325.

CSC 376 Computer Organization (4 Hrs.)

Introduction to elementary computer architecture and

assembly/machine language. Emphasis on the fetch-execute cycle and CPU organization, binary information representations, combinational logic, and sequential circuits. An overview of the memory hierarchy and I/O interfaces included as time permits. Prerequisites: CSC 375 and MAT 302. MAT 302 may be taken concurrently.

CSC 385 Data Structures and Algorithms (4 Hrs.)

Object-oriented software design including sorting and searching algorithms. Implementation of trees, graphs, and other advanced data structures. Algorithm analysis of running times and storage requirements. Prerequisites: MAT 302 and CSC 375.

CSC 387 Foundations of Computer Science (4 Hrs.)

An overview of selected computer science topics: computers and society, software engineering, file structures, database structures, artificial intelligence, theory of computation, and human-computer interaction. Topics are selected to complement material in the core computer science curriculum. Prerequisite: CSC 375.

CSC 388 Programming Languages (4 Hrs.)

Design principles and implementation of computer programming languages. Topics include syntax, data types, control structures, storage management, and binding. Four programming language paradigms studied: imperative, object-oriented, functional, and logical. Languages studied might include Pascal, C, C++, Smalltalk, Java, LISP, and Prolog. Prerequisite: CSC 375.

CSC 389 Introduction to Operating Systems (4 Hrs.)

Assemblers, macro processing, loaders, time sharing operating system, process control, I/O, primary memory allocation, and virtual memory. Prerequisites: CSC 375 and CSC 376.

CSC 410 Current Topics in Professional Development (1 to 4 Hrs.)

Includes materials on current topics that are identified as being on the cutting-edge of computer science. Descriptions change according to topic. May be repeated, but particular topics must differ. See current course schedule for prerequisites. CSC majors need prior approval to apply this course to their degree requirements.

CSC 470 Topics in Computer Science (1 to 4 Hrs.)

Various topics; description changes according to topic offered. May be repeated for an indefinite number of hours, but particular topics must differ. See course schedule for prerequisites.

CSC 472 Introduction to Database Systems (4 Hrs.)

Examination of file organizations and file access methods. Studies various data models including relational, hierarchical, network, and object-oriented. Emphasis given to the relational data model. SQL, the data definition and manipulation language for relational databases, is described. Prerequisite: CSC 375.

CSC 476 Introduction to Microprocessors and Computer Architecture (4 Hrs.)

Analysis and synthesis of combinational and sequential circuits, counters, and decoders. Details of computer organization as applied to microcomputers. Time permitting: control unit design, microprogramming, I/O channels, and memory systems. Prerequisite: CSC 376.

CSC 478 Software Engineering Capstone (4 Hrs.)

Study of the software life cycle with emphasis on design, documentation, and implementation. Team projects and technical communication skills are emphasized. Students should take this course within their last 12 hours of CSC course work. Prerequisite: CSC 385.

CSC 479 Introduction to Artificial Intelligence (4 Hrs.)

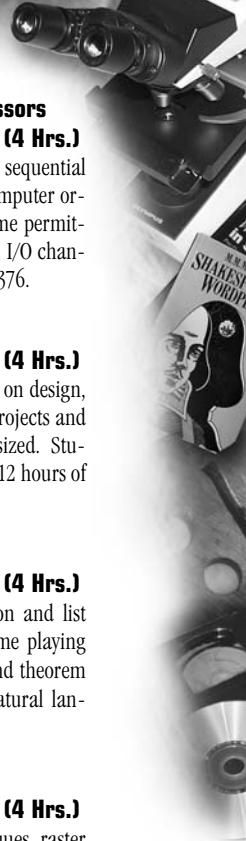
Problem solving methods, data representation and list processing, state-space search strategies, game playing programs, knowledge representation, logic and theorem proving, question answering systems, and natural language processing. Prerequisite: CSC 375.

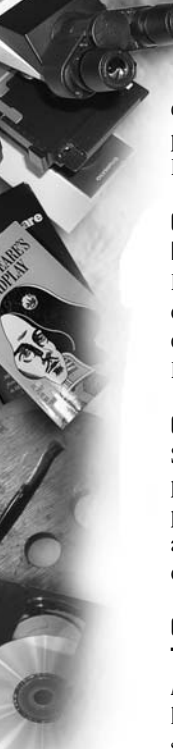
CSC 481 Introduction to Computer Graphics (4 Hrs.)

Basic concepts, display hardware and techniques, raster graphics, 3-D graphics, and processing of pictorial information. Prerequisites: CSC 375.

CSC 483 Introduction to Computer Networks (4 Hrs.)

Network architectures, the ISO reference model, network





design, terminal handling, virtual circuits, datagrams, protocols, routing algorithms, and local area networks. Prerequisite: CSC 376.

CSC 484 Introduction to Parallel Processing (4 Hrs.)

Familiarizes students with the broad field of parallel computing and parallel algorithms, while giving hands-on experience with computing on a parallel architecture. Prerequisite: CSC 376.

CSC 485 Object-Oriented Design (4 Hrs.)

Study of object-oriented design and programming to solve problems. Topics include classes, inheritance, polymorphism, design notations, development environments, and a survey of languages. Programming languages may include C++, Java, and Smalltalk. Prerequisite: CSC 385.

CSC 550 Master's Project/Thesis (4 Hrs./1 Hr.)

An individual study to demonstrate the ability to formulate, investigate, and analyze a problem and to report results. Written report and oral presentation are required. Guidelines for completing this requirement are available from the CSC program and must be consulted before any work is begun. May be repeated but only four hours will count toward the degree. Prerequisite: Approval of the project/thesis supervisor. **Note:** If the project/thesis is not completed during the initial four-hour enrollment, students must register for one hour on an audit basis in all subsequent semesters until the project/thesis is completed.

CSC 570 Advanced Topics in Computer Science (4 Hrs.)

Topics vary. May be repeated for an indefinite number of hours, but particular topics must differ. See course schedule for prerequisites.

CSC 572 Advanced Database Concepts (4 Hrs.)

Study of the implementation of relational database management systems. Topics include database design algorithms, query implementation, execution and optimization, transaction processing, concurrency control, recovery, distributed query processing, and database security. One of the following advanced database topics will also be discussed: deductive databases, parallel databases, knowledge discovery/data mining, data warehousing. Prerequisite: CSC 472.

CSC 574 Operating Systems (4 Hrs.)

Concurrency, mutual exclusion, process cooperation, semaphores, conditional critical regions, deadlock, scheduling, operating system structures, protection system models, virtual machine concept, and system design issues. Prerequisite: CSC 389.

CSC 577 Software Testing and Reliability (4 Hrs.)

Advanced and classic models of testing software are reviewed and critiqued. Current practice and novel theories of reliability are studied, using primary computer science research literature. Some automated testing tools will be used. Prerequisite: CSC 478.

CSC 578 Software Engineering (4 Hrs.)

Problem analysis, system requirements specification, system design, testing methodologies, quality assurance, software maintenance, and automated documentation systems. Team project involving the analysis and creation of a design specification for and formal presentation of a significant software project. Prerequisite: CSC 478.

CSC 581 Computer Graphics (4 Hrs.)

Lighting models, ray tracing, radiosity, texture mapping, and other advanced rendering techniques for creating highly realistic images of three-dimensional scenes. Contemporary and classic articles from the computer graphics literature are studied. Prerequisite: CSC 481.

CSC 582 Design and Evaluation of User Interfaces (4 Hrs.)

Structured approach for designing graphical user interfaces that are easy to use. Empirical evaluation techniques are used to verify that the software is easy to use. Prerequisite: CSC 385.

CSC 583 Network Programming (4 Hrs.)

A historical and technical study of network programming. Emphasis is placed on various network protocols and on the TCP/IP protocol in particular. Assignments involve writing client/server code for Unix in the C programming language. Prerequisite: A working knowledge of Unix and the ability to program in C.