



*Minnesota State University, Mankato* HOLD and CLEAR buttons only compatible with Acrobat V. 4 and 5  
**Curriculum Proposal**

08-115  
✓

Please type or select the requested information. Print completed forms, add appropriate paper attachments, and route through MSU's curricular process for recommendations and decisions.

(Check all that apply):		Proposal #	305
College:	Science, Engineering and Technology	<input checked="" type="checkbox"/> Undergraduate	Effective Date of Change:
Department:	Computer and Information Sciences	<input type="checkbox"/> Graduate	Academic Year
Program:	Computer Science	CIP #	07-08
Type of Change Proposed:	N/A Bulletin Changes	(For Office Use Only)	
Title Current:		Course Designator and Number	Number of Credits
Title Proposed:			
24-Char. Abbrev:		(if applicable)	

*Include a course or program description for the Bulletin (30-40 words maximum for courses, 100 for programs):*  
 Incorporate attach changes to bulletin.

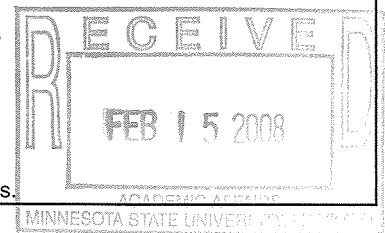
*Rationale or Justification for change:*  
 Correct bulletin to agree w/ changes made during department split.

**\*\*\*For General Education or Cultural Diversity Courses Only\*\*\***

<p align="center"><b>General Education Course:</b></p> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">GE Category #</th> <th>GE Category Name (Maximum of 3 Categories)</th> </tr> </thead> <tbody> <tr><td align="center">N/A</td><td></td></tr> <tr><td align="center">N/A</td><td></td></tr> <tr><td align="center">N/A</td><td></td></tr> </tbody> </table> <p><small>? For Writing Intensive Courses, attach a description of the kind and quantity of writing.          ? For Upper Division Courses, include a description of the respects in which it is broad and general rather than narrow and specific, and so suitable as GE.</small></p> <p>Attach paper copies of the following:          a. Syllabus or course outline.          b. Course's student learning outcomes associated with each GE competency or CD designation.          c. List of strategies to be used to assess students' achievement of each GE competency or CD designation.</p>	GE Category #	GE Category Name (Maximum of 3 Categories)	N/A		N/A		N/A		<p align="center"><b>Cultural Diversity Course:</b></p> <p align="center"><small>(Please check one.)</small></p> <p><input type="checkbox"/> Core (At least 75% devoted to topics of race, gender, sexual orientation, age, class, and disabilities as they occur in United States Society.)</p> <p><input type="checkbox"/> Related (At least 25% devoted to the above topics or to a global perspective on topics related to African American, Asian, Hispanic, and Native American inhabitants of the United States.)</p>
GE Category #	GE Category Name (Maximum of 3 Categories)								
N/A									
N/A									
N/A									

**\*\*\*For New Courses\*\*\***


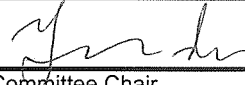
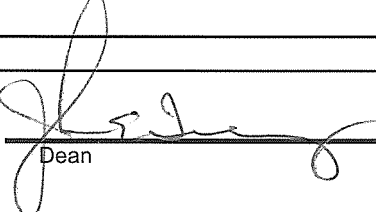

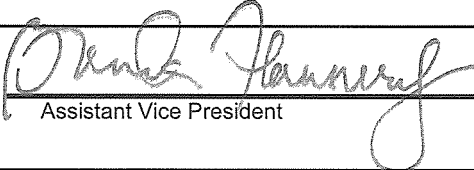
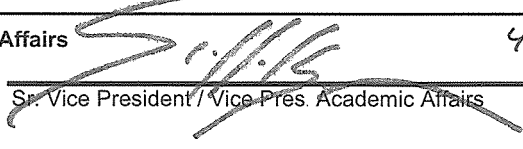
(Check all that apply): <input type="checkbox"/> Course is an elective. <input type="checkbox"/> Course is required for program <input type="checkbox"/> Pre- or Co-requisites: <input type="checkbox"/> Other courses are being changed or eliminated. (Explain.)	Instructional Type: <input type="text" value="Lecture"/> Grading Format: <input type="checkbox"/> Grade <input type="checkbox"/> P/N	Course will be offered: <input type="checkbox"/> Fall Semester <input type="checkbox"/> Spring Semester <input type="checkbox"/> Summer Session
<input type="checkbox"/> Course content or title is similar to courses in other departments. (Attach copy of letter of agreement with other program(s) contacted. Indicate the nature of the discussions and/or resolution of differences or potential conflicts.)		
Attach paper copies of the following: a. Syllabus or course outline. b. Course's student learning outcomes. c. A list of resources required to offer and support this course. d. A description of how teaching this course will affect department staffing. e. If 400/500 level course, an explanation of added expectations of graduate students.		





Minnesota State University, Mankato  
Curriculum Proposal

\*\*\*Signature Page\*\*\*

<b>Department</b>			
<input checked="" type="checkbox"/> Recommended	(Category/ies _____)		2-12-08
<input type="checkbox"/> Not Recommended	(Category/ies _____)	Department Chair	Date
Comments:			
<b>College Curriculum Committee</b>			
<input checked="" type="checkbox"/> Recommended	(Category/ies _____)		2/14/08
<input type="checkbox"/> Not Recommended	(Category/ies _____)	Committee Chair	Date
Comments:			
<b>College Dean</b>			
<input checked="" type="checkbox"/> Recommended	(Category/ies _____)		2/14/08
<input type="checkbox"/> Not Recommended	(Category/ies _____)	Dean	Date
Comments:			
<b>General Education Subcommittee</b>			
<input type="checkbox"/> Recommended	(Category/ies _____)		
<input type="checkbox"/> Not Recommended	(Category/ies _____)	General Education Subcommittee Chair	Date
Comments:			
<b>Undergraduate Curriculum and Academic Policy Committee</b>			
<input checked="" type="checkbox"/> Recommended	(Category/ies _____)		2/4/08
<input type="checkbox"/> Not Recommended	(Category/ies _____)	UCAP Faculty Chair	Date
Comments:			
<b>Faculty Association Graduate Committee</b>			
<input type="checkbox"/> Recommended			
<input type="checkbox"/> Not Recommended		Faculty Association Graduate Chair	Date
Comments:			
<b>Graduate Dean</b>			
<input type="checkbox"/> Recommended			
<input type="checkbox"/> Not Recommended		Graduate Dean	Date
Comments:			
<b>Academic Affairs Council</b>			
<input checked="" type="checkbox"/> Recommended	(Category/ies _____)		4/28/08
<input type="checkbox"/> Not Recommended	(Category/ies _____)	Assistant Vice President	Date
Comments:			
<b>Senior Vice President and Vice President for Academic Affairs</b>			
<input checked="" type="checkbox"/> Approved	(Category/ies _____)		4/28/08
<input type="checkbox"/> Not Approved	(Category/ies _____)	Sr. Vice President / Vice Pres. Academic Affairs	Date
Comments:			

PLEASE LEAVE THIS SHEET ATTACHED TO THESE COPIES

Attached you will find a copy of your college department pages from the 2007-2008 bulletin, please review and make changes or additions only in the highlighted areas. If there are spelling changes in the course descriptions they can be marked otherwise all other changes must go through the curriculum proposal process.

Please mark the changes so that they are easily readable. If there are a lot of changes, please forward to me a word document with the changes.

Any changes that the department is making to redesign the program should not be marked on this copy. Those changes will be made when the curriculum proposal has been approved.

PLEASE RETURN TO KIM PEDERSON @ WA315 by November 19, 2007

Thank you for your prompt attention.

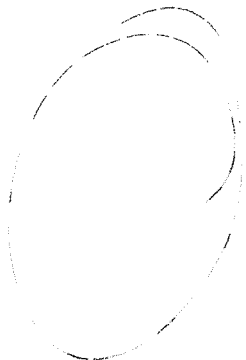
Steven Case

Printed name of person to contact  
(if questions on changes)

5310

Phone extension number

Changes have been made to the attached copies: Yes X No \_\_\_\_\_



**Computer Science**

College of Science, Engineering &amp; Technology

Department of Computer Science

273 Wissink Hall • 507-389-2968

Web site: www.cset.mnsu.edu/cs

Chair: David Haglin

Rebecca Bates, Steven Case, David Haglin, Dean Kelley, Hamed Sallam, Julio Sanchez

Bachelor's degree programs offered by the Department of Computer Science prepare graduates for positions in computer-related fields as well as advanced post-graduate study. Computer science is a field that spans a wide range of topics from theoretical and algorithmic foundations to cutting-edge developments in robotics, computer vision, computational linguistics, intelligent systems, and bio-informatics. The department offers a major and minor in Computer Science. Admission to the Major is granted by the department. Admission to the Major is required before the student is permitted to take 300- and 400-level courses.

Requirements are:

- A minimum of 32 earned semester credits
- Completion of MATH 121 with a grade of "C" or better
- Completion of ENG 101 with a grade of "C" or better
- Completion of CS 110 with a grade of "D" or better
- Completion of CS 111, CS 210, and CS 220 with a grade of "C" or better and a GPA of 2.5 in these courses (or their equivalents).

**COMPUTER SCIENCE BS**

Required General Education (7 credits):

- ENG 101 Composition (4)  
SPEE 100 Fundamentals of Speech Communication (3)

Required Support Courses (7 credits):

- ENG 271 Technical Communication (4)

Choose one of the following Speech courses:

- SPEE 101, SPEE 102, SPEE 202, SPEE 203, SPEE 315, SPEE 325, SPEE 333, or SPEE 403.

Required for Major (Core, 71 credits):

- CS 110 Computer Science I (4)  
CS 111 Computer Science II (4)  
CS 210 Data Structures (4)  
EE 106 Intro to Electrical/Computer Engineering I (3)  
CS 220 Machine Structures and Programming (3)  
CS 300 Large-Scale Software Development (4)  
CS 310 Algorithm Analysis (3)  
CS 320 Computer Architecture (3)  
CS 340 Concepts of Database Management Systems (3)  
CS 350 Network Architectures (3)  
CS 370 Concepts of Programming Language (3)  
CS 380 Analysis and Design of Software Systems (3)  
CS 410 Formal Languages/Abstract Machines (3)  
CS 460 Operating Systems (3)  
CS 495 Computer Science Seminar (1)  
MATH 121 Calculus I (4)  
MATH 122 Calculus II (4)  
MATH 247 Linear Algebra I (4)  
STAT 354 Concepts of Probability and Statistics (3)  
MATH 375 Introduction to Discrete Mathematics (4)  
Capstone Experience (4 credits):  
CS 490 Senior Capstone (4)  
CS 497 Internship (1-4)  
CS 498 Senior Thesis (4)

Required Electives (CS, 9 credits)\*:

Choose an additional nine credits of coursework from the following courses:

- CS 230 Intelligent Systems (4)

- CS 360 Systems Programming (3)  
CS 361 Windows Programming (3)  
CS 415 High Performance Computing (3)  
CS 420 Advanced Computer Architecture (3)  
CS 425 Real-time and Embedded Systems (3)  
CS 430 Artificial Intelligence (3)  
CS 431 Computational Linguistics (3)  
CS 433 Data Mining/Machine Learning (3)  
CS 452 Network Protocol Internals (3)  
CS 454 Mobile & Wireless Networks (3)  
CS 470 Compilers (3)  
CS 480 Advanced Programming Practices (3)  
CS 496 Selected Topics in Computer Science (1-4)  
CS 499 Individual Study (1-2)  
ISYS 202W Computers in Society (4)

\* minimum of 6 credits of required electives must be of 400-level

The following courses are not to be used in this major: CS 171, CS 209, CS 293, CS 296, CS 493.

Required Electives (Science, 12 credits):

Choose one of the following sequences:

- BIOL 105W General Biology I (4)\*  
BIOL 106 General Biology II (4) OR  
CHEM 201 General Chemistry I (5)\*  
CHEM 202 General Chemistry II (5) OR  
GEOL 121 Physical Geology (4)\*  
GEOL 122 Earth History (4)\* OR  
PHYS 221 General Physics I (5)\*  
PHYS 222 General Physics II (5) AND

Any class numbered 200 or above in Astronomy, Biology, Chemistry, Geology, or Physics or one class from another sequence listed above.

\* May be used to fulfill General Education requirements.

Required Minor: Yes. Any. Note that the Mathematics requirements specified above fulfill the requirements for a mathematics minor.

**COMPUTER SCIENCE MINOR**

Required for Minor (Core, 14 credits):

- CS 110 Computer Science I (4)  
CS 111 Computer Science II (4)  
EE 106 Introduction to Electrical/Computer Engineering I (3)

Choose three of the following courses:

- CS 210 Data Structures (4)  
CS 220 Machine Structures and Programming (3)  
CS 310 Algorithm Analysis (3)  
CS 320 Computer Architecture (3)  
CS 350 Network Architectures (3)  
CS 360 Systems Programming (3)  
CS 370 Concepts of Programming Languages (3)  
CS 380 Analysis and Design of Software Systems (3)  
CS 420 Advanced Computer Architecture (3)  
CS 452 Network Protocol Internals (3)  
CS 460 Operating Systems (3)  
CS 470 Compilers (3)

For a hardware emphasis, students should choose CS 220, CS 320, and CS 420. For a networking emphasis, students should choose CS 210, CS 350, and CS 452.

**POLICIES/INFORMATION**

**GPA Policy.** A GPA of 2.5 or higher in courses required for a major or minor in the Department of Computer Science is required for graduation. This GPA requirement is calculated and must be maintained for each of the following areas: 1) for the combined Required General Education and Required Support Courses, or their substitutions, if any; 2) for the Required for Major and Required Electives courses. Refer to the College regarding required advising for students on academic probation.

**Grading Policy.** All coursework applied towards the major or minor, including required general education and support courses, must be taken for a letter grade

## COMPUTER SCIENCE

except for courses offered only as P/N. A minimum grade of "C" is required in all courses which are to be applied towards a departmental major or minor program, including those required courses which are in supporting areas (such as ENG 271). In addition, a minimum grade of C is required for all prerequisite courses. Grades of "D" are not accepted by the department. ~~Any student who receives a "D" or "F" in a CS class, or who drops a CS class after the first two weeks of the semester, will have a hold for CS classes put on his/her registration. In other words, he/she will not be able to register for future CS courses until the hold is released. To have the hold released, the student must meet with his/her advisor and present the advisor with an appeal form. This form will be available from the Office of Computer Science (273 Wissink Hall).~~

**Incomplete Policy.** An incomplete grade for a course will generally be given only under two conditions. The first condition is illness — a doctor's written recommendation must be supplied. The second condition arises when a death in the student's family has caused the student to be away from the campus for an extended period of time. The student must have a satisfactory grade ("C" or better) in the course at the time of the onset of the condition.

**Residency.** At least 50 percent of the computer and information sciences credits required for a major or minor from this department must be earned at Minnesota State-Mankato. *from the Department of Computer Science at Minnesota State University Mankato.*

### COURSE DESCRIPTIONS

#### CS 110 (4) Computer Science I

Students will learn programming skills in object-oriented C++. Students will design algorithms and learn how to write, compile, run and debug programs that include selection and repetition structures, functions, and arrays. Study skills and professional development will be addressed.

Pre: MATH 112 (College Algebra)

Fall, Spring

#### CS 111 (4) Computer Science II

Continues the exploration of introductory Computer Science begun in CS 110. Focus is on developing basic knowledge of algorithms, programming skills and problem solving techniques. Topics include recursion, sorting, linked lists, stacks and queues.

Pre: MATH 115 or MATH 113, and CS 110

Fall, Spring

#### CS 171 (2) Introduction to C++ Programming

This course provides an introduction to programming using C++. Emphasis on structured programming concepts, with a brief discussion of object-oriented programming. Control structures, expressions, input/output, arrays and functions.

Pre: MATH 113 or MATH 115

Fall, Spring

#### CS 209 (2) C++ for Java Programmers

C++ syntax for students who already know Java. Specific topics: data types, operators, functions, arrays, string operations, pointers, structures, classes, constructors, destructors, pointers as class members, static classes, "this" pointer, operator functions, data type conversions, inheritance, polymorphism, and dynamic binding.

Pre: Consent

Variable

#### CS 210 (4) Data Structures

Investigates efficient data structuring techniques to support a variety of operations in different problem scenarios. Topics include binary trees, binary search trees, multiway search trees, hashing and hash tables, priority queues, and algorithm analysis for best, worst and average cases.

Pre: CS 111 and MATH 121

Fall, Spring

#### CS 220 (3) Machine Structures and Programming

This course introduces students to assembly language programming and basic machine structures. Topics include number systems; basic central processing unit

(CPU) organization, instruction formats, addressing modes and their use with a variety of data structures; and parameter passing techniques.

Pre: CS 110 and EE 106

Fall, Spring

#### CS 230 (4) Introduction to Intelligent Systems

Fundamentals of data mining and knowledge discovery. Methods include decision tree algorithms, association rule generators, neural networks, and web-based mining. Rule-based systems and intelligent agents are introduced. Students learn how to apply data-mining tools to real-world problems.

Pre: CS 110

Fall

#### CS 293 (1) MAX Scholar Seminar

This class provides MAX scholars with an opportunity to explore a set of topics related to achieving success in academic, professional and personal realms. Speakers will include faculty, graduate students, visiting researchers and industry members as well as student participants.

Pre: Recipient of a MAX scholarship or instructor consent

Fall, Spring

#### CS 295 (1) Computer Science Seminar

Provides students interested in a computer science major or minor an opportunity to explore topics not normally covered in the curriculum. Speakers will include faculty, graduate students, undergraduate students admitted to the Computer Science major, visiting researchers and industry members.

Fall, Spring

#### CS 296 (1-2) Introduction to Selected Topics

Special topics not covered in other 100 or 200-level courses. May be repeated for each new topic.

Variable

#### CS 300 (4) Large-Scale Software Development

A team-based capstone experience for the mid-point of the CS program. Students are introduced to principles and methodologies of large-scale software development and engineering by working on a full life-cycle software project solving a substantial problem using multiple CS concepts.

Pre: CS 210 and CS 220

Spring

#### CS 310 (3) Algorithm Analysis

Algorithm design and analysis is central to much of computer science. This course exposes students to fundamental algorithm design and analysis techniques. Topics include many of the basic topic areas of computer science: searching, sorting, numeric computation, data representation, communication.

Pre: CS 210

Fall

#### CS 320 (3) Computer Architecture

This course presents historical and current concepts and implementations of computer organization. Topics include instruction set design, digital storage, performance metrics, processor datapath and control, pipelining, memory hierarchy, busses and I/O interfacing, and parallel processors.

Pre: CS 111 and CS 220, or EE 234 and EE 334

Spring

#### CS 340 (3) Concepts of Database Management Systems

This course covers the fundamentals of database management focusing on the relational data model. Topics include database organization, file organization, query processing, concurrency control, recovery, data integrity, optimization and view implementation.

Pre: CS 210 and CS 320

Fall

#### CS 350 (3) Network Architectures

An introduction to data communications and networks. The field encompasses local area networks, wide area networks, and wireless communication. Topics

include digital signals, transmission techniques, error detection and correction, OSI model, TCP/IP model, network topologies, network protocols, and communications hardware.

Pre: CS 210 and CS 320  
Spring

### CS 360 (3) Systems Programming

This course focuses on machine level I/O and operating system file processing. Structure of systems programs including assemblers, linkers, and object-oriented utilities and interfaces. Students will gain experience in writing utility programs and extensions to an operating system.

Pre: CS 111 or EE 107, and CS 320  
Fall

### CS 361 (3) Windows Programming

This course introduces the student to Windows programming in C++ using the Application Programming Interface. Windows programs are created in a visual development environment which includes editing and code generating facilities. Hands-on programming skills are developed in the lab.

Pre: CS 210  
Variable

### CS 370 (3) Concepts of Programming Languages

Fundamental concepts of programming languages, including principles of language design, language constructs, and comparison of major languages. Topics: formal methods of examining syntax and semantics of languages and lexical analysis of language components and constructs, and propositional and predicate calculi.

Pre: CS 210  
Fall

### CS 380 (3) Analysis and Design of Software Systems

Students are introduced to techniques used in analysis and design of software systems. Traditional techniques are reviewed and current methodologies for both object-oriented and procedural systems are studied. Standard notations used to document software requirements and designs are presented.

Pre: CS 300  
Spring

### CS 410 (3) Formal Languages/Abstract Machines

This course studies the theoretical underpinnings of modern computer science, focusing on three main models of computation: DFA, PDA, and Turing Machines. Students determine model capabilities and limitations: what is and is not computable by each of them.

Pre: CS 310 and MATH 375  
Fall

### CS 415 (3) High Performance Computing

High Performance Computing techniques used to address problems in computational science. Topics include application areas and basic concepts of parallel computing, hardware design of modern HPC platforms and parallel programming models, methods of measuring and characterizing serial and parallel performance.

Pre: CS 310, CS 350, and MATH 247  
Variable

### CS 420 (3) Advanced Computer Architecture

This course addresses advanced topics in computer architecture including a major emphasis on measuring and improving computer performance. Topics include advances in pipelining and analysis and optimization of storage systems and networks, multiprocessor challenges and trends.

Pre: CS 320 and MATH 375  
Variable

### CS 425 (3) Real-time and Embedded Systems

This course provides an overview of embedded and real-time systems including design principles, methodologies, design tools and problem solving techniques. Students design and build a real-time operation system with a microprocessor to

host real-time service data processing using sensor/actuator devices.

Pre: CS 210 and CS 320  
Variable

### CS 430 (3) Artificial Intelligence

Basic introductory concepts and a history of the field of Artificial Intelligence (AI) are covered. Emphasis is placed on the knowledge representation and reasoning strategies used for AI problem solving. Solutions are found using the LISP programming language.

Pre: CS 210 or CS 230  
Fall-Aut

### CS 431 (3) Computational Linguistics

Computational linguistics topics covered include regular expressions, finite state automata, information theory, context free grammars, hidden Markov models and Viterbi algorithms. Students will work on problems within the field including parsing, machine translation, speech recognition, information extraction and parsing.

Pre: CS 210 or CS 230  
Fall-Aut

### CS 433 (3) Data Mining and Machine Learning

A blend of computer science, information science, and statistics for storing, accessing, modeling, and understanding large data sets. Topics include fundamental data mining algorithms: decision trees, classification, regression, association rules, statistical models, neural networks, and support vector machines.

Pre: CS 210 and STAT 354  
Spring-Aut

### CS 452 (3) Network Protocol Internals

As an advanced coverage of data communication, this course explores principles, protocols and performance evaluation techniques of advanced networking technologies. Topics include error detection and recovery, flow control, routing, data throughput, and performance analysis of existing and emerging Internet protocols.

Pre: CS 350 and STAT 354  
Variable

### CS 454 (3) Mobile and Wireless Networks

Emerging mobile and wireless data networks technologies covered include standard wireless protocols (e.g., Bluetooth, IEEE 802.11, RFID, and WAP), and development of mobile and wireless applications (e.g., J2ME, WML, Brew). Includes research, design, and implementation of a wireless, mobile application.

Pre: CS 320 and CS 350  
Variable

### CS 460 (3) Operating Systems: Design & Implementation

This course studies historical and current concepts and implementations of computer operating systems. Basic operating systems topics include processes, interprocess communication, interprocess synchronization, deadlock, memory allocation, segmentation, paging, resource allocation, scheduling, file systems, storage, devices, protection, security, and privacy.

Pre: CS 210 and CS 320  
Spring

### CS 470 (3) Compilers

This course offers an introduction to specification and implementation of modern compilers. Topics include lexical scanning, parsing, type checking, code generation and translation, optimization, and compile-time and run-time support for modern programming languages. Students build a working compiler.

Pre: CS 370  
Variable

### CS 480 (3) Advanced Programming Practices

This course covers advanced programming for general-purpose software development. Topics include tools and processes appropriate for employing object-oriented designs and programming within a significant software develop-

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## COMPUTER SCIENCE

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ment environment and advanced data structures and algorithms, graphical user interfaces, and software development processes.

Pre: CS 300 and CS 380

Variable

### CS 490 (4) Senior Capstone

Students gain experience working with a team to solve a substantial problem in the field of computer science using concepts that span several topic areas in computer science. Class time focuses primarily on project design and implementation.

Pre: Senior standing and successful completion of all core requirements.

Spring

### CS 493 (1) MAX Scholar Seminar

This class is for MAX scholars and covers topics related to achieving success in academic, professional and personal realms. Speakers will include faculty, graduate students, visiting researchers and industry members. Students will mentor lower division scholars and do presentations.

Pre: Recipient of a MAX scholarship or instructor consent

Fall, Spring

### CS 495 (1) Computer Science Seminar

Provides Computer Science majors or minors an opportunity to explore topics not normally covered in the curriculum. Speakers will include faculty, graduate students, undergraduate students admitted to the Computer Science major, visiting researchers and industry members. This class may be repeated for credit.

Prerequisite: Admitted to major

Fall, Spring

### CS 496 (1-4) Selected Topics in Computer Science

Special topics not covered in other courses. May be repeated for credit on each new topic.

Pre: Consent

Variable

### CS 497 (1-6) Internship

This course is designed to provide students with an opportunity to utilize their training in a real-world environment. Participants work under the guidance and direction of a full-time staff member. (At most 4 hours towards the CS major.)

Pre: Permanent admission to the CS major, CS 300, consent.

### CS 498 (4) Senior Thesis

Advanced study and research required. Topic of the senior thesis determined jointly by the student and the faculty advisor.

Pre: Senior standing and consent

Fall, Spring

### CS 499 (1-2) Individual Study

Problems in the field of computer science are studied on an individual basis under the guidance of a faculty mentor.

Pre: Consent

Fall, Spring