

08-59



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

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 #	<b>178</b>
College:	Science, Engineering and Technology	<input checked="" type="checkbox"/>	Undergraduate	Effective Date of Change:	
Department:	Computer Science	<input type="checkbox"/>	Graduate	Academic Year	<b>07-08</b>
Program:	Computer Science	CIP # _____		(For Office Use Only)	
Type of Change	PROGRAM PROPOSALS			Course Designator	Number of
Proposed:	Change in Requirements-Course(s) Added			and Number	Credits
Title Current:					
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):  
No change to program description.

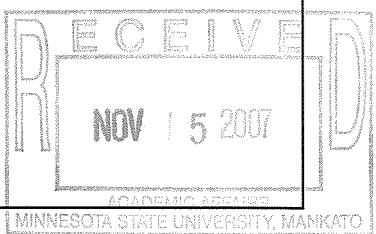
*Rationale or Justification for change:*  
The attached modifications correct a missing line in the list of required courses, clarify the required science elective based on the change to the calculus-based Physics sequence, and generalize the set of courses that may be used for the required electives.

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

<b>General Education Course:</b>		<b>Cultural Diversity Course:</b> (Please check one.) <input type="checkbox"/> <b>Core</b> (At least 75% devoted to topics of race, gender, sexual orientation, age, class, and disabilities as they occur in United States Society.) <input type="checkbox"/> <b>Related</b> (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.)
GE Category #	GE Category Name (Maximum of 3 Categories)	
N/A		
N/A		
<p>For Writing Intensive Courses, attach a description of the kind and quantity of writing.</p> <p>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.</p> <p>Attach paper copies of the following:</p> <ol style="list-style-type: none"> <li>Syllabus or course outline.</li> <li>Course's student learning outcomes associated with each GE competency or CD designation.</li> <li>List of strategies to be used to assess students' achievement of each GE competency or CD designation.</li> </ol>		

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

(Check all that apply):	Instructional Type: <input type="text" value="Lecture"/>	Course will be offered:
<input type="checkbox"/> Course is an elective.	Grading Format: <input type="checkbox"/> Grade <input type="checkbox"/> P/N	<input type="checkbox"/> Fall Semester
<input type="checkbox"/> Course is required for program		<input type="checkbox"/> Spring Semester
<input type="checkbox"/> Pre- or Co-requisites:		<input type="checkbox"/> Summer Session
<input type="checkbox"/> Other courses are being changed or eliminated. (Explain.) _____		
<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:		
<ol style="list-style-type: none"> <li>Syllabus or course outline.</li> <li>Course's student learning outcomes.</li> <li>A list of resources required to offer and support this course.</li> <li>A description of how teaching this course will affect department staffing.</li> <li>If 400/500 level course, an explanation of added expectations of graduate students.</li> </ol>		





Minnesota State University, Mankato  
Curriculum Proposal

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

**Department**

Recommended (Category/ies \_\_\_\_\_)  
 Not Recommended (Category/ies \_\_\_\_\_)


  
 Department Chair

11-13-07  
 Date

Comments:

**College Curriculum Committee**

Recommended (Category/ies \_\_\_\_\_)  
 Not Recommended (Category/ies \_\_\_\_\_)

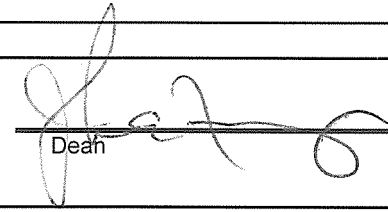
  
 Committee Chair

11-13-07  
 Date

Comments:

**College Dean**

Recommended (Category/ies \_\_\_\_\_)  
 Not Recommended (Category/ies \_\_\_\_\_)

  
 Dean

11/15/07  
 Date

Comments:

**General Education Subcommittee**

Recommended (Category/ies \_\_\_\_\_)  
 Not Recommended (Category/ies \_\_\_\_\_)

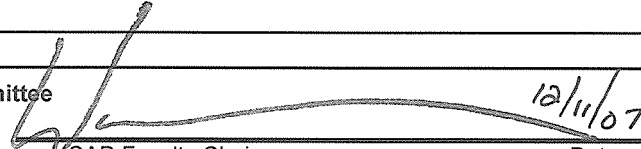
General Education Subcommittee Chair

Date

Comments:

**Undergraduate Curriculum and Academic Policy Committee**

Recommended (Category/ies \_\_\_\_\_)  
 Not Recommended (Category/ies \_\_\_\_\_)

  
 UCAP Faculty Chair

12/11/07  
 Date

Comments:

**Faculty Association Graduate Committee**

Recommended  
 Not Recommended

Faculty Association Graduate Chair

Date

Comments:

**Graduate Dean**

Recommended  
 Not Recommended

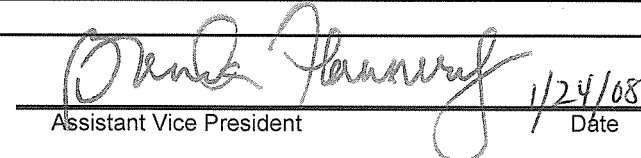
Graduate Dean

Date

Comments:

**Academic Affairs Council**

Recommended (Category/ies \_\_\_\_\_)  
 Not Recommended (Category/ies \_\_\_\_\_)


  
 Assistant Vice President

1/24/08  
 Date

Comments:

**Senior Vice President and Vice President for Academic Affairs**

Approved (Category/ies \_\_\_\_\_)  
 Not Approved (Category/ies \_\_\_\_\_)

  
 Sr. Vice President / Vice Pres. Academic Affairs

1/28/08  
 Date

Comments:

Computer Science Faculty Meeting 11-13-07

In Attendance: Sanchez, Bates, Case, Sallam Kelley Haddix

Bates made the motion to approve the previous minutes of 101-5-07.

Sanchez seconded the motion.

No discussion.

Motion passed

Bates made the motion to accept the revised curriculum proposal for adjusting the Physics science sequence with the proposal revised based on the recommendation of the college curriculum committee. The revised proposal is a program proposal rather than a bulletin change.

Sallam seconded the motion.

No discussion

Motion passed.

Respectfully Submitted,

Mary Asher  
Department Secretary



**COMPUTER SCIENCE MINOR**

Required for Minor (Core, 11 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 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 (373 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.

**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, buses 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-Alt

**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-Alt

**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-Alt

CS 452 (As an ad protocol technolo data thrc protocol Pre: CS Variable

CS 454 Emergir standard developi cludes n Pre: CS Variable

CS 460 This co comput interprc allocati storage. Pre: CS Spring

CS 470 This co compil tion an modet Pre: C Variabl

CS 480 This c develo object- ment e interfa Pre: C Variabl

CS 49 Studer field o scienc Pre: S Spring

CS 45 This c in acc gradu ment Pre: F Fall, ;

CS 4 Provi not n stude resea Pre: F Fall,

### 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 development 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

## Construction Management

*College of Science, Engineering & Technology*  
*Department of Interior Design & Construction Management*  
354 Wiecking Center 507-389-6385  
[www.MankatoConstructionDegree.com](http://www.MankatoConstructionDegree.com)

Chair: Scott Fee

### Construction Management Major:

The Construction Management major prepares graduates for success in the rapidly changing construction industry. Coursework emphasizes management (including a required minor in Business Administration) with an additional focus on technology and systems specific to the construction industry. Typical entry-level positions include field manager, assistant superintendent, project engineer, scheduler, assistant estimator, project cost controller and safety director.

Admission to Major is granted by the College of Science, Engineering and Technology. Minimum University admission requirements are:

-A minimum of 32 earned semester credit hours

-A minimum cumulative GPA of 2.00

Contact the CSET Advising Center for application procedures.

### CONSTRUCTION MANAGEMENT BS - Core (42 credits):

CM 106	Construction Experience (1)
CM 111	Intro to Design & Construction Management (1)
CM 212	Surveying & Site Planning (2)
CM 215	Fundamentals of Estimating (3)
CM 216	Construction Methods (3)
CM 248	Contract Documents (2)
CM 250	Mechanical & Electrical Systems (3)
CM 281	Architectural Graphics (3)
CM 311	Equipment Management (2)
CM 312	Foundations & Concrete Structures (3)
CM 413	Cost Estimating & Bidding (3)
CM 414	Advanced Estimating & Scheduling (3)
CM 424	Construction Safety & Loss Control (2)
CM 445	Construction Systems Management (3)
CM 497	Internship (8)

## **Computer Science**

College of Science, Engineering & Technology  
Department of Computer Science  
273 Wissink Hall • 507-389-2968  
Web site: [www.cset.mnsu.edu/cs](http://www.cset.mnsu.edu/cs)

Chair: Steven Case

Rebecca Bates, Steven Case, Furman Haddix, 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 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 bioinformatics. The department offers a major and minor in Computer Science.

**Admission to 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, 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: 101, 102, 202, 203, 315, 325, 333, or 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 1 (3)

CS 220 Machine Structures and Programming (3)

CS 221 Machine Structures and Programming Lab (1)

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 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 including Category I courses, if any.

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 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.

**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 science credits required for a major or minor from this department must be earned 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)

F, S

### **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

F, S

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

**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.

F, S

**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

S

**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

F

**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 EE234 and EE334

S

**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

F

**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

S

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

F alt

### **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

F alt

### **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

Variable

### **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 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

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

Problems on an individual basis.

Pre: Consent

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