Computing

Division of Computing

Mission: The mission of the Division of Computing is to provide students with an opportunity to obtain the knowledge of computing necessary to succeed in today's increasingly technical world. The division's curriculum focuses on both theoretical knowledge and practical applications that enrich analytic, creative, and research capabilities essential to success in various computing fields. Our curriculum provides students the opportunities to pursue individual interests through special topic courses, internships, and projects that further enhance their learning experience outside the traditional classroom setting. Introductory courses in various computer-related topics are offered for non-major students.

Student Learning Outcomes

Students will:

- Understand and be able to demonstrate analytic and critical reasoning ability through algorithmic development and software implementation.
- Communicate effectively utilizing current technology in information systems. This includes the acquisition, summarization, and presentation of existing and synthesized knowledge.
- Demonstrate an understanding of computer and communication systems and hardware and software systems, including the design, development, implementation, and integration into an organization.

Students may obtain a Bachelor of Science degree with a major in computer science, computer information systems, cybersecurity, or management information systems. These majors focus on the scientific and business views of computing. Students in these majors develop the skills essential to becoming quality programmers. In addition, the upper-division requirements available to each of the majors provide the necessary specialized knowledge and skills.

Students within all majors experience a variety of programming environments including many microcomputer systems as well as multi-user environments. Students are exposed to a number of modern programming languages appropriate to their selected majors and gain valuable experience with a wide selection of computer hardware and resources. This variety of resources coupled with elective courses allows students to personalize the specialized knowledge they wish to obtain.

The division also offers minors in computer science, computer information systems, and applied artificial intelligence. Students who complete the required courses for the minor can expect to obtain programming skills and general computing knowledge.

COMPUTER SCIENCE

- **Major: 60 credit hours**
- **Minor: 22 credit hours**

PROGRAM REQUIREMENTS:

- **Major/Minor GPA required for graduation: 2.25**
- **Must take any two science courses with a laboratory requirement**
- **All courses for the major and minor must be completed with a grade of C- or better**

Description of Major: Computer science majors are provided with the systems programming and problem-solving skills commonly expected in technical positions at employers that require strong analytical and interpersonal skills. In addition, they obtain the necessary theoretical background required to pursue further education and advanced degrees. Majors in computer science should expect employment in both the industrial sector and scientific lab environments.

COMPUTER SCIENCE MAJOR REQUIREMENTS		60 crs.
REQUIRED COURSES		**51 crs.**
CSI 131	COMPUTATIONAL THINKING	2
CSI 132	INTRODUCTION TO PROGRAMMING	3
CSI 230	INTRODUCTION TO COMPUTING	5
CSI 235	MATHEMATICS OF COMPUTING	3
CSI 300	COMPUTER ORGANIZATION AND ARCHITECTURE	3
CSI 330	DATA STRUCTURES AND ALGORITHMS	3
CSI 335	ANALYSIS OF ALGORITHMS	3
CSI 345	THE STRUCTURE OF OPERATING SYSTEMS	3
CSI 410	SOFTWARE ENGINEERING	3
CSI 450	COMPUTER NETWORKING AND COMMUNICATIONS	3
CSI 465	COMPILER DESIGN	3
CSI 497	SENIOR SEMINAR I	1
CSI 498	SENIOR SEMINAR II	2
ENG 360	INTERDISCIPLINARY PROFESSIONAL AND TECHNICAL WRITING (W)	3
MTH 210	CALCULUS I	4
MTH 211	CALCULUS II	4
MTH 170	STATISTICS	3

THREE COURSES FROM THE FOLLOWING		9 crs.
CSI 366	NUMERICAL ANALYSIS	3
CSI 369	SOCIAL, LEGAL, AND ETHICAL ISSUES OF COMPUTING (W)	3
CSI 380-389	SPECIAL TOPICS IN COMPUTING AND INFORMATION SYSTEMS	3
CSI 415	ADVANCED DATABASE CONCEPTS	3
CSI 420	ADVANCED DATABASE CONCEPTS	3
CSI 430	COMPUTER GRAPHICS AND USER INTERFACE DESIGN	3
CSI 435	FORMAL LANGUAGES AND AUTOMATA (W)	3
CSI 440	ARTIFICIAL INTELLIGENCE	3
CSI 470	INTERNSHIP IN COMPUTING AND INFORMATION SCIENCE	3
CSI 480	INDEPENDENT STUDY IN COMPUTING AND INFORMATION SCIENCE	3
CSI 337	INFORMATION SECURITY	3
CSI 445	DATA MINING	3

COMPUTER SCIENCE MINOR REQUIREMENTS		22 crs.
CSI 131	COMPUTATIONAL THINKING	2
CSI 132	INTRODUCTION TO PROGRAMMING	3
CSI 230	INTRODUCTION TO COMPUTING	5
CSI 300	COMPUTER ORGANIZATION AND ARCHITECTURE	3
CSI 330	DATA STRUCTURES AND ALGORITHMS	3
TWO UPPER-LEVEL CSI ELECTIVES		6

COMPUTER INFORMATION SYSTEMS

- **Major: 67 credit hours**
- **Minor: 22 credit hours**

PROGRAM REQUIREMENTS:

- **Major/Minor GPA required for graduation: 2.25**
- **All courses for the major and minor must be completed with a grade of C- or better**

Description of Major: Computer information systems majors study a variety of business-related topics in addition to their programming skills and formal course work in database management, networking, and systems analysis. The course work ensures that the students obtain a thorough view of the modern business world and the impact of information technology on modern business practices. Computer information systems majors are prepared for further education in a graduate program or for employment in one of many jobs such as database administration, network administration, or applications programming.

COMPUTER INFORMATION SYSTEMS MAJOR REQUIREMENTS		67 crs.
REQUIRED COURSES		**61 crs.**
CSI 131	COMPUTATIONAL THINKING	2
CSI 132	INTRODUCTION TO PROGRAMMING	3
CSI 205	DATA VISUALIZATION	3
CSI 215	INTRODUCTION TO DATABASES	3
CSI 230	INTRODUCTION TO COMPUTING	5
CSI 235	MATHEMATICS OF COMPUTING	3
CSI 300	COMPUTER ORGANIZATION AND ARCHITECTURE	3
CSI 315	SYSTEMS ANALYSIS AND DESIGN	3
CSI 330	DATA STRUCTURES AND ALGORITHMS	3
CSI 415	ADVANCED DATABASE CONCEPTS	3
CSI 417	PROJECT MANAGEMENT	3
CSI 450	COMPUTER NETWORKING AND COMMUNICATIONS	3
CSI 497	SENIOR SEMINAR I	1
CSI 498	SENIOR SEMINAR II	2
ENG 360	INTERDISCIPLINARY PROFESSIONAL AND TECHNICAL WRITING (W)	3
ECO 211	PRINCIPLES OF MICROECONOMICS	3
ACC 205	PRINCIPLES OF FINANCIAL ACCOUNTING	3
ACC 230	PRINCIPLES OF MANAGERIAL ACCOUNTING	3
MGT 204	PRINCIPLES OF MANAGEMENT	3
MKT 205	PRINCIPLES OF MARKETING	3
MTH 170	STATISTICS	3

TWO COURSES FROM THE FOLLOWING		6 crs.
CSI 325	ELECTRONIC COMMERCE	3
CSI 345	THE STRUCTURE OF OPERATING SYSTEMS	3
CSI 369	SOCIAL, LEGAL, AND ETHICAL ISSUES OF COMPUTING (W)	3
CSI 380-389	SPECIAL TOPICS IN COMPUTING AND INFORMATION SYSTEMS	3
CSI 425	WEB PROGRAMMING	3
CSI 337	INFORMATION SECURITY	3
CSI 445	DATA MINING	3
CSI 470	INTERNSHIP IN COMPUTING AND INFORMATION SCIENCE	3
CSI 480	INDEPENDENT STUDY IN COMPUTING AND INFORMATION SCIENCE	3

COMPUTER INFORMATION SYSTEMS MINOR REQUIREMENTS		22 crs.
CSI 131	COMPUTATIONAL THINKING	2
CSI 132	INTRODUCTION TO PROGRAMMING	3
CSI 215	INTRODUCTION TO DATABASE	3
CSI 230	INTRODUCTION TO COMPUTING	5
CSI 315	SYSTEMS ANALYSIS AND DESIGN	3
CSI 417	PROJECT MANAGEMENT	3
MGT 204	PRINCIPLES OF MANAGEMENT	3

CYBERSECURITY

- **Major: 61 credits**

PROGRAM REQUIREMENTS:

- **Major GPA required for graduation: 2.25**
- **All courses for the major must be completed with a grade of C- or better**

Mission: The mission of this program is to educate students in technology and in securing cyber systems with both technical and non-technical methods.

Student Learning Outcomes

Students will:

- Demonstrate analytic and critical reasoning ability through the analysis, development, and implementation of security solutions to cyber systems.
- Communicate effectively utilizing current technology in information systems, which includes the acquisition, summarization, and presentation of existing and synthesized knowledge.
- Demonstrate an understanding of security issues in regards to computer and communication systems. This includes both hardware and software systems, including the design, development, implementation, and integration of security systems into an organization's Infrastructure.

Description of Major: Students majoring in cybersecurity are provided with analytical and problem-solving skills to evaluate and summarize fundamental cybersecurity concepts, theories, and strategies. Additionally, they are prepared to recommend technical and non-technical security solutions on various cyber systems, interpret and apply cyber incident response plans, and assess risks, vulnerabilities and threats to cyber systems. They obtain the necessary theoretical background required to pursue further education and advanced degrees. With a major in cybersecurity, students should expect employment in both the industrial sector and in government agencies.

CYBERSECURITY

MAJOR REQUIREMENTS		61 crs.
CSI 131	COMPUTATIONAL THINKING	2
CSI 132	INTRODUCTION TO PROGRAMMING	3
CSI 205	DATA VISUALIZATION	3
CSI 215	INTRODUCTION TO DATABASES	3
CSI 230	INTRODUCTION TO COMPUTING	5
CSI 235	MATHEMATICS OF COMPUTING	3
CSI 300	COMPUTER ORGANIZATION AND ARCHITECTURE	3
CSI 330	DATA STRUCTURES AND ALGORITHMS	3
CSI 337	INFORMATION SECURITY	3
CSI 345	THE STRUCTURE OF OPERATING SYSTEMS	3
CSI 357	ETHICAL HACKING	3
CSI 369	SOCIAL, LEGAL AND ETHICAL ISSUES OF COMPUTING (W)	3
CSI 410	SOFTWARE ENGINEERING	3
CSI 434	INTRODUCTION TO CRYPTOGRAPHY	3
CSI 445	DATA MINING	3
CSI 450	COMPUTER NETWORKING AND COMMUNICATIONS	3
CSI 467	DIGITAL FORENSICS	3
CSI 497	SENIOR SEMINAR I	1
CSI 498	SENIOR SEMINAR II	2
ENG 360	INTERDISCIPLINARY PROFESSIONAL AND TECHNICAL WRITING (W)	3
MTH 170	STATISTICS	3

MANAGEMENT INFORMATION SYSTEMS

- **Major: 58 credits**

PROGRAM REQUIREMENTS:

- **Major GPA required for graduation: 2.25**
- **All courses for the major must be completed with a grade of C- or better**
- **Capstone: Senior Seminar I (CSI 497) and Senior Seminar II (CSI 498)**

Description of Major: Management information systems majors complete coursework in computing and business. They are prepared for graduate study; for employment as information technology managers, systems analysts, or tech consultants; or for other positions requiring an understanding of information technology in a business setting.

MANAGEMENT INFORMATION SYSTEMS

MAJOR REQUIREMENTS		58 crs.
CSI 131	COMPUTATIONAL THINKING	2
CSI 132	INTRODUCTION TO PROGRAMMING	3
CSI 205	DATA VISUALIZATION	3
CSI 215	INTRODUCTION TO DATABASES	3
CSI 230	INTRODUCTION TO COMPUTING	5
CSI 315	SYSTEMS ANALYSIS AND DESIGN	3
CSI 337	INFORMATION SECURITY	3
CSI 417	PROJECT MANAGEMENT	3
CSI 497	SENIOR SEMINAR I	1
CSI 498	SENIOR SEMINAR II	2
CSI 369	SOCIAL, LEGAL AND ETHICAL ISSUES OF COMPUTING (W)	3
or		
BUS 324	BUSINESS ETHICS AND CORPORATE SOCIAL RESPONSIBILITY (W)	3
MGT 204	PRINCIPLES OF MANAGEMENT	3
ACC 205	PRINCIPLES OF FINANCIAL ACCOUNTING	3
ACC 220	ACCOUNTING INFORMATION SYSTEMS	3
BUS 303	BUSINESS LAW I	3
BUS 310	QUANTITATIVE ANALYSIS FOR BUSINESS DECISIONS	3
MGT 314	ORGANIZATIONAL BEHAVIOR	3
MGT 376	OPERATIONS MANAGEMENT	3
BUS 410	MANAGEMENT INFORMATION SYSTEMS	3
MTH 170	STATISTICS	3

APPLIED ARTIFICIAL INTELLIGENCE

Minor: 18 credit hours

PROGRAM REQUIREMENTS:

All courses for the minor must be completed with a grade of C- or higher.

Mission: The mission of this program is to provide students with a foundation in the underlying concepts of modern artificial intelligence (AI) and machine learning (ML).

Student Learning Outcomes

Students will:

- Demonstrate analytic and critical reasoning ability through the analysis, development, and implementation of AI and ML systems and tools.
- Communicate effectively utilizing current technology in information systems, including the acquisition, summarization, and presentation of existing and synthesized knowledge.
- Demonstrate an understanding of AI and ML regarding existing tools and model development, including the design, development, implementation, and integration of AI and ML systems into an organization's infrastructure.

Description of Minor: Students pursuing a minor in applied artificial intelligence develop analytical and problem-solving skills essential for evaluating and synthesizing core AI concepts, theories, and strategies. Students acquire the foundational knowledge necessary for advancing their education and pursuing post-baccalaureate degrees in computing.

APPLIED ARTIFICIAL INTELLIGENCE MINOR REQUIREMENTS		18 crs.
CSI 112	ARTIFICIAL INTELLIGENCE LITERACY	1
CSI 131	COMPUTATIONAL THINKING	2
CSI 141	PYTHON PROGRAMMING	3
CSI 205	DATA VISUALIZATION	3
CSI 341	APPLIED MACHINE INTELLIGENCE	3
CSI 440	ARTIFICIAL INTELLIGENCE	3
MTH 170	STATISTICS	3

Computing (CSI)

CSI 105 **1**
INTRODUCTION TO DATABASE MANAGEMENT
The fundamentals of database systems will be presented. Different sections will be offered to provide students with the opportunity to learn a database software package.

CSI 106 **1**
INTRODUCTION TO OPERATING SYSTEMS
The fundamentals of operating system use will be presented. Different sections will be offered to provide students with the opportunity to learn the use of an operating system with different computer systems such as Windows 95, UNIX, and the Macintosh.

CSI 107 **1**
INTRODUCTION TO COMPUTER NETWORKS
The fundamentals of accessing and using computer networks will be presented. Topics may include software and tools for electronic mail, file transfer, terminal access, web browsing, web page creation, and real-time computer communication.

CSI 109 **1-3**
SPECIAL TOPICS IN COMPUTER USE
This course addresses topics related to the use of specific software packages and/or systems to explore issues related to a variety of academic disciplines.

CSI 112 **1**
ARTIFICIAL INTELLIGENCE LITERACY
An exploration into the field of artificial intelligence (AI), including historical events leading to the current state of AI, its impact on society, and ethical consideration in the use of AI. Technical developments, current AI systems, and the future of AI are investigated.

CSI 120 **3**
COMPUTER CONCEPTS AND APPLICATIONS
This course is intended to provide students with a general perspective on computers and their role and other technology-related areas. The course provides an introduction to various common software packages (for example, word processors, spreadsheets, and presentation graphics), a history of computers, basic hardware components, commonly used number systems, logic, and algorithmic development. The course includes a required 1-hour laboratory component.

CSI 131 **2**
COMPUTATIONAL THINKING
An introduction to computational thinking. Topics to be discussed include computational thinking, algorithm development, problem solving, and professional disciplines in computing. Students will use flowcharts, code tracing, and control structures to implement algorithmic solutions to problems. Prerequisite of high school algebra proficiency, or a co-requisite of 133 or 210.

CSI 132 **3**
INTRODUCTION TO PROGRAMMING
An introduction to programming and problem solving. This course is a continuation of CSI 131. Topics to be discussed include more problem-solving strategies, programming, and software design techniques. Students will be introduced to arrays, functions, structs, external files, and searching and sorting strategies. Prerequisite: CSI 131.

CSI 140 **4**
INTRODUCTION TO PROGRAMMING USING JAVA
This course focuses on an intense introduction to the practice of programming. Topics discussed include problem solving strategies, algorithmic development, quality programming practices, and the implementation of algorithms using the Java programming language. Constructs of the Java language covered include but are not limited to loops, decision statements, and classes. Prerequisite: MTH 133 or equivalent.

CSI 141 **3**
PYTHON PROGRAMMING
This course offers a practical, hands-on exploration of Python programming, focusing on applications. Participants will engage in designing and constructing software tailored to solve problems across diverse fields using Python. Throughout the course, students will become proficient in utilizing packages and data structures and leveraging tools essential for data science. Prerequisite: CSI 131.

CSI 201 **(0-.5)**
APPLIED INFORMATION TECHNOLOGY
This course will focus on topics related to the administration of information technology systems. Topics vary each semester. Subjects could include, but not be limited to hardware maintenance, life cycle management of hardware and software, shell scripting, system backup, system replication, and basic networking. May be repeated for credit 4 times. Prerequisites: CSI 132 and instructor consent.

CSI 205 DATA VISUALIZATION **3**
This course introduces the analysis and visual presentation of data. Students will learn to apply visualization tools, techniques, and concepts to explore large data sets, discover meaningful patterns and relationships, and explain complex data to various audiences. Fundamental statistics, as well as principles of color theory and visual perception, essential for crafting compelling graphic displays, are covered. Additionally, the course covers strategies for creating effective information designs, evaluating the evidence presented in tables, charts, and various forms of visual representation, and presenting quantitative information in a compelling manner. Students will gain hands-on experience using software to uncover meaningful data patterns and effectively communicate their findings. Examples, projects, and assignments are from subject areas, including biology, business, population studies, environmental science, and politics.

Computing (CSI)

CSI 215 **3**
INTRODUCTION TO DATABASES
This course covers the relational model, relational algebra, and SQL. In addition, the course covers relational design principles based on dependencies and normal forms. Additional database topics from the design and application-building perspective will also be covered. Prerequisite: CSI 132.

CSI 220 **3**
INTRODUCTION TO PROGRAMMING LANGUAGE
This course will introduce and explore the syntactic rules and essential concepts necessary for writing programs in a selected programming language. Specific languages will vary depending upon demand and perceived importance in the fields of computing. Prerequisite: CSI 132.

CSI 230 **5**
INTRODUCTION TO COMPUTING
An introduction to software design techniques necessary for writing programs of moderate complexity. The course provides thorough coverage of control structures, functions, and arrays. File input and output, pointers, and recursive functions are introduced. Primary emphasis is on object-oriented programming including the development of classes, inheritance, operator overloading, and polymorphism. This course includes a required 2-hour lab component. Prerequisite: CSI 132.

CSI 235 **3**
MATHEMATICS OF COMPUTING
This course covers mathematical topics necessary for understanding concepts in computer science. Topics include sets, relations, functions, Boolean algebras, switching circuits, number theory, induction, recursion, solving recurrences, introduction to pseudo-code, probability, elementary counting techniques, and graphs. May not be taken for credit towards a major in mathematics. Pre/co-requisite: CSI 131.

CSI 240 **4**
INTRODUCTION TO COMPUTER SYSTEMS
The course focuses on the operation and administration of the computer and its role in information systems. The course introduces topics common to all operating systems such as CPU scheduling, memory management, and virtual memory. This course covers an introduction to computer architecture and organization including memory organization, processor architecture, and instruction sets. This course cannot be used for credit in CS or CIS. Prerequisites: CSI 230 or 140, or equivalent, and CSI 121.

CSI 260 **3**
EVENT DRIVEN PROGRAMMING
This course is an introductory course in event-driven programming. It focuses on designing programs and systems that contain effective Graphical User Interfaces for computer users. Platforms for development will include the use of tools such as Visual Basic, web-based HTML forms, or the Java Abstract Windowing Toolkit. Prerequisite: CSI 132.

CSI 280-289 **3**
SPECIAL TOPICS IN COMPUTING AND INFORMATION SYSTEMS

CSI 299 **1-3**
PRACTICUM IN COMPUTING
For students at the sophomore level or above who wish to arrange a practicum in a laboratory or appropriate business learning environment in computer science. Prerequisites: 15 hours of related coursework, grade point average consistent with departmental graduation requirements, and instructor consent. Note: No more than 9 credit hours combined total for this practicum, any internship, or any independent study may be counted toward the major.

CSI 300 **3**
COMPUTER ORGANIZATION AND ARCHITECTURE
This course concentrates on the relationship between computing hardware and machine language instruction sets as well as introductory digital electronics. The course examines logic gates, machine language, and assembly language. Students will also study digital electronics and computer circuit design with small and medium scale integrated circuits. Several computer systems and microprocessors are used as examples. Prerequisite: CSI 230.

CSI 315 **3**
SYSTEMS ANALYSIS AND DESIGN
This course presents concepts, methodologies, and tools required for the successful analysis, design, and implementation of today's information systems. The entire system development life cycle will be covered. In addition, both structured and object-oriented techniques will be presented. Prerequisites: CSI 215, 230.

CSI 325 **3**
ELECTRONIC COMMERCE
This course offers a practical review of e-commerce and e-business issues. It covers the infrastructure, alternative business models, opportunities, challenges, and pitfalls. Both the relevant technologies and business issues will be discussed and amply exemplified. Prerequisite: MGT 204 or instructor consent.

CSI 330 **3**
DATA STRUCTURES AND ALGORITHMS
A study of common and useful data structures such as lists, stacks, queues, trees, graphs, and variations of these structures along with the essential and necessary algorithms to manipulate these structures. Algorithms to be covered will include searching and sorting techniques, data traversals, graph algorithms, numerical algorithms, string algorithms, and hashing. Prerequisites: CSI 230 and CSI 235.

CSI 335 **3**
ANALYSIS OF ALGORITHMS
This course introduces the student to tools and techniques necessary in the analysis of algorithms. The course includes a systematic study of algorithms and their complexity with application to searching and sorting, pattern matching, geometric and graph algorithms, NP-complete, and intractable problems. The student will study mathematical concepts including summations, recurrence relations, introductory number theory, binomial coefficients, and generating functions. Prerequisites: CSI 330, MTH 210.

Computing (CSI)

CSI 337 **3**
INFORMATION SECURITY
This course will provide an introduction to basic information security principles and practices. Topics covered will include the CIA (confidentiality, integrity, and availability) model, risk management, access controls, authentication models, intrusion detection, and vulnerabilities. In addition, basic legal and social issues will also be covered. Prerequisite: CSI 230.

CSI 341 **3**
APPLIED MACHINE INTELLIGENCE
This course provides an overview of the field of artificial intelligence with emphasis on contemporary techniques and applications of machine learning. The course introduces fundamental concepts such as supervised, unsupervised, and reinforcement learning. Students will gain a conceptual introduction to regression, classification, and clustering. Students will complete projects in application areas such as biology, medicine, business, or social sciences. Prerequisites: MTH 170 and CSI 141 or 230.

CSI 345 **3**
THE STRUCTURE OF OPERATING SYSTEMS
The hardware and software requirements for modern operating systems are studied. Topics include operating system services, file systems, CPU scheduling, deadlock, memory management, virtual memory, disk scheduling, and concurrent programming. Prerequisites: CSI 300, 330.

CSI 357 **3**
ETHICAL HACKING
This course considers attacks, exploits, and techniques used to penetrate application security defenses and the reduction of vulnerabilities to such attacks. Students learn how to protect systems by first learning how attackers exploit systems. Topics covered include intrusion detection, policy creation, social engineering, DoS attacks, spearphishing, mobile code attacks, buffer overflows, firewalls, VPN's, and virus creation. Prerequisite: CSI 369.

CSI 366 **3**
NUMERICAL ANALYSIS
An introductory course in numerical methods, including computational techniques for locating roots of equations, interpolation, differentiation, integration, approximation, and systems of linear equations; to include detection, prediction, and control of computational errors. Problem solving using mathematical software and the design of algorithms is stressed. Prerequisites: MTH 212, CSI 230; Same as MTH 366.

CSI 369 **3**
SOCIAL, LEGAL AND ETHICAL ISSUES OF COMPUTING (W)
This course addresses the ethical, legal, and social issues which affect those involved in modern computing. Additionally, the course will examine privacy issues, civil, criminal, and administrative law, and information security governance. Specific topics will vary from semester to semester but general topics will include issues of privacy, security, and crime as they relate to computing. Prerequisite: Minimum of 12 hours of completed units in CSI or instructor consent.

CSI 380-389 **3**
SPECIAL TOPICS IN COMPUTING AND INFORMATION SYSTEMS

CSI 410 **3**
SOFTWARE ENGINEERING (W)
This course provides students with an opportunity to work on large-scale, group programming projects. It also introduces a set of general software security coding practices that can be integrated into the software development lifecycle. Topics will include tools for large-scale design, documentation techniques, programming paradigms (e.g. Object Oriented-Programming), and portability issues. Prerequisite: CSI 330.

CSI 415 **3**
ADVANCED DATABASE CONCEPTS
This course will build upon the concepts presented in CSI 215. Topics covered will include SQL tuning, and the implementation, support, and maintenance of relational databases. In addition, techniques for architecting, building, and scaling databases for future growth will be presented. Special emphasis will be given to database security, performance, and availability. Prerequisites: CSI 215, 300, 330.

CSI 417 **3**
PROJECT MANAGEMENT
This course will cover topics and skills that are necessary for the successful management of today's complex information technology projects. Scheduling, cost control, and scope management will each receive extensive coverage. In addition, team building, risk management, and procurement activities will also be covered. Prerequisites: MGT 204 and either CSI 120 or CSI 132.

CSI 420 **3**
THEORY OF PROGRAMMING LANGUAGES
This course examines the organization of programming languages, with emphasis on design concepts such as language definition structures, semantics, procedural, functional, object-oriented, and logic programming. The major features of several programming languages will also be discussed. Prerequisite: CSI 330.

CSI 425 **3**
WEB PROGRAMMING
This course will investigate the use of programming tools that are useful in developing web-based applications. A portion of the course will examine client-side scripting using tools such as JavaScript or Java applets. However, the focus will be on server-side tools such as Java servlets, Perl CGI programs or PHP scripts. The student will study how to use these programs to interact with a database system. Standard encryption methods for web-based applications such as the use of SSL, the secure socket layer, will also be presented. Students will develop various projects that illustrate these points throughout the semester. Prerequisite: minimum of 15 credit hours of CSI courses including CSI 215.

Computing (CSI)

CSI 430 **3**
COMPUTER GRAPHICS AND USER INTERFACE DESIGN
This course will introduce the student to programming techniques necessary for the production of programs that produce graphical images and/or use a graphical interface. Students will produce programs which use interactive graphics and will study the necessary theory which underlies modern graphical programming. Topics will include drawing algorithms, matrix manipulations, 2D and 3D rendering techniques, color models, user interface concepts, interactive graphics, and animation techniques. Prerequisite: CSI 330.

CSI 434 **3**
INTRODUCTION TO CRYPTOGRAPHIC METHODS IN CYBERSECURITY
This course provides an introduction to cryptographic methods in cybersecurity, including the design and implementation of cryptographic systems. Topics covered include principles of cryptography, classical ciphers, simple cryptanalysis, symmetric primitives, asymmetric encryption and digital signatures, and protocol design and analysis. Prerequisites: CSI 230, 235, MTH 170.

CSI 435 **3**
FORMAL LANGUAGES AND AUTOMATA (W)
This course examines the fundamental limitations and properties of computation. Students will explore various models of computation including regular expressions, finite state machines, context-free grammars, push-down automata, and Turing machines. Classes of languages including regular languages, context-free languages, recursive languages, and RE languages will also be explored. Same as MTH 435. Prerequisites: CSI 330, ENG 360.

CSI 440 **3**
ARTIFICIAL INTELLIGENCE
A study of the techniques and issues related to the study of Artificial Intelligence. Software design techniques and algorithms specific to AI will be covered including neural networks, decision trees, game trees, probabilistic algorithms, rule-based systems, and search strategies. Applications are examined in game playing, pattern recognition, robotics, machine perception, expert systems, natural language understanding, and machine learning. Prerequisite: CSI 330 or 341.

CSI 445 **3**
DATA MINING
This course is an introduction to data mining. Data mining is concerned with the extraction of knowledge from large data sets. The field encompasses techniques from artificial intelligence, statistics, and databases. Students are introduced to the concepts, issues, tasks, and techniques of data mining. Topics include data preparation, exploratory data analysis, pattern recognition, machine learning, classification, clustering, evaluation and validation, scalability, and data mining applications. Prerequisites: CSI 230, MTH 170.

CSI 450 **3**
COMPUTER NETWORKING AND COMMUNICATIONS
This course concentrates on typical hardware interfaces, programming methods, and communication protocols. Topics considered in detail include electrical interfaces, data transmission, protocol basics, LAN's, WAN's, bridged networks, interworking, and application support. Students will develop an understanding of network security protocols used to prevent, detect, and correct potential vulnerabilities. Prerequisite: CSI 300 or instructor consent.

CSI 451 **3**
BUSINESS DATA COMMUNICATIONS
This course presents a survey of fundamental data communications concepts from a business management perspective. Topics covered include networking, distributed applications, network management, security, and the use of the Internet, intranets, and extranets. Prerequisites: BUS 410, CSI 120.

CSI 465 **3**
COMPILER DESIGN
The analysis of source code, generation of object code, and the techniques of syntax analysis, symbol table construction, and error checking are considered. Students will work on a semester project to produce a high-level language compiler. Prerequisite: CSI 330.

CSI 467 **3**
DIGITAL FORENSICS
This course covers detection and prevention of intrusions and attacks, digital evidence collection and evaluation, automatic intrusion detection, pattern matching and statistical techniques, firewalls, and vulnerability scanning. Additionally, topics regarding seizure, chain of custody, and technical issues in acquiring computer evidence are covered. Prerequisite: CSI 369.

CSI 470 **3-8**
INTERNSHIP IN COMPUTING AND INFORMATION SCIENCE
No more than three hours of this course may be applied towards the major.

CSI 480 **1-3**
INDEPENDENT STUDY IN COMPUTING AND INFORMATION SCIENCE
No more than three hours of this course may be applied toward the major.

CSI 497 **1**
SENIOR SEMINAR I
This capstone course combines with CSI 498 and requires that students design and define a project. Projects will involve current topics in computing and information science and incorporate material from several of the courses required for their major. Projects will be researched and documented. Each student will lead a class discussion and make a presentation about their project proposal. Other current topics related to computing and information science as well as careers in those areas are presented. Prerequisites: Senior standing and 21 CSI credit hours.

Computing (CSI)

CSI 498 **2**

SENIOR SEMINAR II

This capstone course combines with CSI 497 and requires that students implement a project that was defined in the previous course. Projects will involve current topics in computing and information science and incorporate material from several of the courses required for their major. Projects will be researched and documented with a formal paper completed at its conclusion. Each student will lead a class discussion and make a formal presentation about their project. Other current topics related to computing and information science as well as careers in those areas are presented. This course will concentrate on the definition and design of the project to be implemented. Prerequisite: CSI 497.