M.S. INFORMATION SYSTEMS

OVERVIEW

The Master of Science in Information Systems program (M.S.-I.S.) is designed to meet the needs of three distinct groups:

1. Students with a baccalaureate degree in Information Systems;
2. Students with a baccalaureate degree in another area who have information systems skills and desire to develop new career skills in Information Systems; or
3. Students with a baccalaureate degree in another area who lack information systems skills and desire to develop new career skills in Information Systems.

Students should select an advisor and discuss the courses required for their degree early in their graduate program.

The M.S.-I.S. requires completion of at least 30 (33 with thesis) hours of graduate credit. Students may choose to do a thesis as part of this degree program. The degree is offered online, face-to-face, or a combination of the preceding two formats.

Program Level Student Learning Outcomes

The student will be able to:

1. Write about technical and non-technical subjects in computer information systems.
2. Communicate orally about technical and non-technical subjects in computer information systems.
3. Work well as a part of diverse team.
4. Evaluate computer information systems solutions for business situations and select “best” alternative.
5. Identify the ethical, legal, security, and social issues inherent in information systems.
6. Engage in continued professional development.
7. Research and evaluate current and emerging trends and technologies in order to build effective organizational solutions.
8. Understand the role information systems plays in supporting organizational decision-making and for achieving competitive advantage.
9. Analyze business needs, and then acquire and/or design and develop the appropriate solution from existing and emerging technologies and tools.

Entry Requirements

Students will be admitted into the MS Information Systems major by the faculty once the following application criteria are met:

- Successful admission to graduate school.

Master of Science - Information Systems With Thesis Program Requirements

All courses applicable to the program must be attained, at least 30 hours are required for the degree.

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<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
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<tr>
<td>CIS 5304</td>
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<td>3</td>
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<td>Advanced Systems Analysis and Design</td>
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<td>CIS 5382</td>
<td>Research Methods in Computer Information Systems</td>
<td>3</td>
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<td>Approved graduate-level CIS electives</td>
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<tr>
<td>CIS 5398</td>
<td>Computer Information Systems Thesis</td>
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<td>Total Credit Hours</td>
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Master of Science - Information Systems Without Thesis Program Requirements

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<td>Total Credit Hours</td>
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Courses

CIS 3300. Computer Technology and Impact. 3 Credit Hours.
Explores computer technology with special attention to its impact on home, work, and school. Many topics are presented: hardware and software fundamentals, essential applications, telecommunications, internet, artificial intelligence, programming, and the future of these technologies. Students work with word processing, spreadsheet, database, and presentation software; other applications; and a programming language. No prior computer experience necessary.
CIS 3301. Business Analysis with Spreadsheets. 3 Credit Hours.
Examine theory and application of microcomputer technology applied in accounting, finance, management, and other business disciplines. Develop creative initiative, and study basic analytical skills in performing common business tasks. Credit for both CIS 3301 and ACCT 3301 will not be awarded.

CIS 3302. Introduction to Business Analytics. 3 Credit Hours.
Examine theory and application of business analytics applied in accounting, finance, marketing, management, and other business disciplines. Develop basic analytical skills to gain insights and make better decisions. Special emphasis on descriptive statistics, data visualization, descriptive data mining, linear regression, forecasting, optimization models, spreadsheet models, Monte Carlo simulation, and decision analysis.

CIS 3303. Programming Logic and Design. 3 Credit Hours.
This course introduces computer programming and problem solving in a structured program logic environment. Study the logic of decision-making, nested looping, multidimensional arrays, implementation of the structure theorem and Boolean algebra. Utilize structured flowcharts, structured pseudocode, hierarchy charts and decision tables, in order to document logical problem solutions. The course focuses on business problem solving and does not count as a programming language. No prior programming experience is necessary.

CIS 3304. Topics in Computer Information Systems. 3 Credit Hours.
Examine selected topics in programming languages, programming techniques, or job control languages. May be repeated once for credit as topics vary. Prerequisite(s): Varies with topic.

CIS 3305. Operating Systems Theory and Practice. 3 Credit Hours.
Study the history, development, and principles of computer operating systems and their variants in mainframe, minicomputer, server, and microcomputer application environments. Explore preferred operating systems representing various hardware environments. Special emphasis on related software issues, programming capabilities, and job control languages. Prerequisite(s): CIS 3303 or permission of department chair.

CIS 3306. Data Visualization. 3 Credit Hours.
Data visualization makes it easier to understand the data. The goal of this course is to introduce students to data visualization including both the principles and techniques. Students will learn the value of visualization, specific techniques in information visualization and scientific visualization, and how to understand how to best leverage visualization methods.

CIS 3307. Application Project with Laboratory. 3 Credit Hours.
Develop and document a software product using a formal software development process. Projects of value are actively sought from local businesses, governments, or nonprofit organizations when possible. May be repeated for credit when topics change. Prerequisite(s): Varies with topic.

CIS 3312. Technical Support Management and Operations. 3 Credit Hours.
Study the scope, significance, job skills, training, software availability, and support problems of technical support within the technology industry. Develop technical support skills, with an emphasis on the use of resources, troubleshooting, and customer relations.

CIS 3315. Web Site Development and Design. 3 Credit Hours.
This course introduces students to basic web design using HTML and CSS. The course does not require any prior knowledge of HTML or web design. Students learn how to plan and design effective web pages; implement web pages by writing HTML and CSS code; enhance web pages with the use of page layout techniques, text formatting, graphics, images, and multimedia; and produce a functional, multi-page website.

CIS 3330. C++ Programming. 3 Credit Hours.
Study structured C++ programming using microcomputers. Special emphasis on syntax, operators, functions, standard input/output, arrays, pointers, and structures in C++ programming. Prerequisite(s): COSC1309 OR COSC 1336 or CIS 3303 or concurrent enrollment or permission of department chair.

CIS 3331. Visual Basic Programming. 3 Credit Hours.
Study visual application development using Visual Basic and the native integrated development environment. Examine logic, working with forms, sequential and direct file access, and scope and visibility rules. Analyze problems within Visual Basic and develop programming solutions. Prerequisite(s): COSC1309 OR COSC 1336 or CIS 3303 or concurrent enrollment or permission of department chair.

CIS 3332. Java Programming. 3 Credit Hours.
Study applications development using Java. Examine identifiers and reserved words, objects and primitive data, program statements, arrays and vectors, exceptions and I/O streams, and graphical user interfaces. Analyze problems within Java and develop programming solutions. Prerequisite(s): COSC1309 OR COSC 1336 or CIS 3303 or concurrent enrollment or permission of department chair.

CIS 3340. Advanced C++ Programming. 3 Credit Hours.
Study C++ programming language. Examine advanced features of C++ such as classes, friends, abstraction, operator overloading, inheritance, polymorphism, templates, and object oriented programming techniques. Analyze problems within C++ and develop programming solutions. Prerequisite(s): CIS 3330 or permission of department chair.

CIS 3341. Advanced Visual Basic Programming. 3 Credit Hours.
Study Visual Basic programming techniques, including declaration and manipulation of arrays, accessing database files, and advanced data handling techniques. Analyze advanced problems in Visual Basic and develop programming solutions. Prerequisite(s): CIS 3331 or permission of department chair.

CIS 3342. Advanced Java Programming. 3 Credit Hours.
Study Java programming language. Examine advanced Java capabilities, including class features, error handling, security techniques, Java streams, JavaBeans, database connectivity, Java servlets, Java Server pages, and advanced object-oriented programming techniques. Analyze advanced Java problems and develop programming solutions. Prerequisite(s): CIS 3332 or permission of department chair.

CIS 3343. C# Programming for Windows and the Web. 3 Credit Hours.
Use C# programming language to create Windows applications in the Internet and intra-network environment. Explore object-oriented design, client-server interaction, event-driven programming, graphical user interfaces, distributed data, and distributed applications. Prerequisite(s): CIS 3330 or CIS 3331 or CIS 3332 or permission of the department chair.

CIS 3345. Topics in Personal Computer Software and Application. 3 Credit Hours.
Examine selected personal computer applications and software packages. Explore the operation and usefulness of commonly available personal computing software solutions. May be repeated once for credit as topics vary. Prerequisite(s): Varies with topic.
CIS 3346. Personal Computer Technology. 3 Credit Hours.
Examine the technology and hardware operations in microcomputers, their peripherals, and operating system software. Special emphasis on hardware configuration and selection, installation and test procedures, and routine maintenance.

CIS 3347. Data Communications and Infrastructure. 3 Credit Hours.
A study of telecommunications architecture, industry standards and communications protocols, the placement of networking devices and components, transmission media selection, logical and physical topologies, voice and data transmission, and structured cabling for local area networks (LANs) and wide area networks (WANs). Application exercises will include evaluating alternatives available in hardware, software, and transmission facilities, design integration, selection and implementation of communications and networking solutions. In addition, students will explore the current and future impact and directions of these technologies. Students will complete an architecture design project that will include required components and address services as specified in an industry specific Request for Proposal (RFP).

CIS 3348. Networking Architecture and Design. 3 Credit Hours.
Examine industry standards and communications protocols in networking. Learn placement of networking devices, transmission media selection, topologies, data transmission, and structured cabling for LANs and WANs. Develop network designs as specified in an industry specific Request for Proposal (RFP). Prepare and present a design proposal in response to an RFP, and installation, configuration, testing and troubleshooting of WAN/LAN wiring interface technologies. Prerequisite(s): CIS 3347 or permission of department chair.

CIS 3351. Data Structures. 3 Credit Hours.
Study theory and applications of commonly used computer data structures, files, file organization and access methods, databases, and other storage and retrieval methods. Prerequisite(s): CIS 3340 or CIS 3341 or CIS 3342 or CIS 3343 or concurrent enrollment or permission of department chair.

CIS 3360. Ethics in Computing. 3 Credit Hours.
(WI) Examine personal and contemporary organizational ethical issues and challenges in the design, development and the use of computing technologies in a global environment. Special emphasis on the philosophical basis for computer ethics, reliability and safety of computer systems, protecting software and other intellectual property, computer crime and legal issues, and professional codes of ethics (AIS, ACM, IEEE etc.).

CIS 3361. Introduction to Computer Forensics. 3 Credit Hours.
The course focuses on clear and authoritative instructions about the field of computer forensics as it applies to the investigative process; from the collection of digital evidence to the presentation of Computer Forensic Examination findings in a court of law. Upon successful completion of the course, students will have a basic understanding of the computer forensic process, the scientific procedure involved in accounting, law enforcement, and computer sciences. Topics also include the science of computer forensics and how it relates to and is utilized within the judicial system of the United States.

CIS 3365. System Analysis and Design. 3 Credit Hours.
Examine systematic analysis, design, and implementation of software systems with special emphasis on the processes and skills used in the first four stages of the System Development Life Cycle. Analyze traditional and current methodologies in design, including computer aided analysis and design tools. Prerequisite(s): CIS 3330 or CIS 3331 or CIS 3332, or permission of department chair.

CIS 3387. Cooperative Education. 3 Credit Hours.
Develop and apply relevant CIS concepts in a work environment. Work in an approved professional CIS setting for approximately 300 hours before credit will be granted. To remain in the program, the student must remain in good standing with the university and employer. May be repeated once for credit. Prerequisite(s): Permission of co-op coordinator and department chair, and formal application to the program. Field experience fee $75.

CIS 3389. Special Topics in Computer Information Systems. 3 Credit Hours.
Examine selected issues, products, and technology current to computer information systems. This course may be repeated once for credit. Prerequisite(s): Varies with the topic or Permission of department chair.

CIS 4301. Database Theory and Practices. 3 Credit Hours.
Examine database concepts and structures, and understand file and data management principles underlying database construction. Learn fundamental types of database models, with emphasis on relational databases and major non-relational forms. Develop skills in analysis, design, development, and optimization of working database applications on a variety of problems. Prerequisite(s): 12 hours of CIS courses or permission of department chair.

CIS 4302. Advanced Business Analytics. 3 Credit Hours.
Follow the traditional descriptive/predictive/prescriptive framework to analyze large sets of data and explain the theory of formulating statistical models. Special emphasis on cluster analysis, Naïve Bayes, Optimization Modeling, simple and multiple linear regression, and ensemble modeling. Prerequisite(s): CIS 3302.

CIS 4303. Data Mining. 3 Credit Hours.
Discover basic concepts, tasks, methods, and techniques in data mining, and analyze data mining problems and their solutions. Develop an understanding of the data mining process, learn various techniques for data mining, and apply the techniques in solving problems using data mining tools and systems. Prerequisite(s): CIS 3302 or CIS 4301.

CIS 4307. Topics in Networking. 3 Credit Hours.
Explore selected topics in alternative or innovative network software packages, including network focused tools, utilities, and operating systems. Special emphasis on an exploration of the usefulness and operation of the topic of study. May be repeated once for credit. Prerequisite(s): Varies with topic.

CIS 4308. Advanced Programming Language. 3 Credit Hours.
Develop programming proficiency in a modern programming language. May be repeated as topics vary. Prerequisite(s): Varies with topic or Permission of department chair.

CIS 4309. Decision Support Methods. 3 Credit Hours.
Use computer-based decision, analysis, planning, and presentation methods in the context of management strategy and problem-solving policy. Apply software tools such as databases, spreadsheets, statistical graphics, and presentation programs for extracting, organizing and presenting information in support of management decision making. Prerequisite(s): COSC 1301 or CIS 3300, or ACCT 2302 or ACCT 2402 or MGMT 3301 or FIN 3301 or MKTG 3314 or BUSI 3311, or permission of department chair.

CIS 4310. Artificial Intelligence. 3 Credit Hours.
A study of AI programming techniques and tools. Topics include Expert Systems, Neural Networks, Genetic Algorithms, Automatic Programming, heuristic search, and others. Prerequisite(s): CIS 3330 or CIS 3331 or CIS 3332 or permission of department chair.
CIS 4311. Android Application Development. 3 Credit Hours.
This course explores the design and development of mobile applications such as Android, including resources, user interfaces, services, alarms, maps and location based services. Prerequisite(s): CIS 3332 or Permission of Department Chair.

CIS 4335. UNIX Systems Administration. 3 Credit Hours.
Examine the underlying conceptual considerations of the UNIX operating system and its variants in mainframe, minicomputer, server and microcomputer application environments. Explore memory and process management, multi-programming and processing, interrupt structure, and parallel processing mechanisms and procedures. Special emphasis on practical application of configuration and security of selected UNIX systems. Prerequisite(s): CIS 3305 or 12 hours of CIS courses or permission of department chair.

CIS 4340. Algorithm Design and Analysis. 3 Credit Hours.
Examine computer algorithms, and learn to select appropriate algorithms for tasks within specific computing environments. Study searching and sorting algorithms for their importance in computing. Special emphasis on efficiency, readability, maintainability, advanced design and analysis techniques, advanced data structures, and graph algorithms. Prerequisite(s): CIS 3351 or concurrent enrollment or permission of department chair.

CIS 4341. Information Technology Security and Risk Management. 3 Credit Hours.
Examine the fundamental principles and topics of Information Technology Security and Risk Management at the organizational level. Learn critical security principles and best practices in order to plan, develop and perform security tasks. Special emphasis on hardware, software, processes, communications, applications, and policies and procedures with respect to organizational IT Security and Risk Management. Prerequisite(s): 12 hours of CIS Courses or Permission of the department chair.

CIS 4342. Computer Security Principles and Practices. 3 Credit Hours.
Explore current principles, theories, and concepts behind computer security. Examine basic methods and practices of security as it affects modern business operations. Special emphasis on cryptography, authentication, access control, database security, malware, intrusion detection, firewalls, security policy and management, software and operating system security, auditing and legal aspects of cyber security. Prerequisite(s): 12 hours of CIS courses or permission of department chair.

CIS 4343. Advanced Systems and Analysis. 3 Credit Hours.
Examine data and process decomposition, and modeling in advanced systems analysis. Study the CASE tools which support models and interaction analysis of process and data. Explore the enterprise-wide view of system analysis, and understand the theory behind and the generation of normalized relational database tables. Prerequisite(s): CIS 3365 and CIS 4301 or permission of department chair.

CIS 4345. Network and Systems Security. 3 Credit Hours.
Studies the issues of Network and Systems Security as a continuous process involving analysis, implementation, evaluation and maintenance. Topics will include addressing computer-related risks, case analysis, and future trends. The course will provide approaches, techniques, and best practices for securing modern electronic data systems and networks. Areas covered include information and message security, database and file integrity, physical security, security management, security risk analysis, and encryption/cryptography. Will include practical laboratories in the analysis, and configuration of networking security protocols and tools. Prerequisites: CIS 3347 or approval of Department Chair. Lab fees: $95.

CIS 4346. Applied Security. 3 Credit Hours.
This course will validate and develop in-depth hands on knowledge about the operation and defense from malicious attacks. It builds on previous course work to understand rapid recovery and defense of systems from attack. Students develop knowledge about system vulnerabilities and the process of penetration of systems as a way to evaluate the security of systems. Specific topics include social engineering, malware and malicious software usage and identification, network security tool familiarization and system hardening. Prerequisite(s): CIS 3347 and (CIS 4341 or CIS 4342) or approval of department chair. Lab Fee: $95.

CIS 4348. Security Trends and Malware Analysis. 3 Credit Hours.
This course analyzes and investigates security threats and ethical hacking methods. It will introduce students to modern malware analysis techniques through a detailed examination of malware, virus, and malicious code operation by examining case studies and hands-on interactive analysis of real world samples. The course will also examine in detail current trends in the threat environment and the most current attack exploits. Student will use a variety of methods to investigate current security threats and their mitigation. Topics include malware morphology, disassembly of malware, ethical hacking methods on systems including penetration, and trends in the threat-scape. Prerequisite(s): CIS 4345 or CIS 4346 or approval of department chair. Lab fees $95.

CIS 4350. Management Information Systems. 3 Credit Hours.
Study management issues related to business information systems designed to meet the informational needs of the various business subsystems. Special emphasis on the concepts of systems development, security, privacy and ethics associated with information systems.

CIS 4351. IS Project Management. 3 Credit Hours.
This course studies the processes, methods, techniques and tools that organizations use to manage their information systems projects. The course covers a systematic methodology for initiating, planning, executing, controlling, and closing projects. This course assumes that project management in the modern organization is a complex team based activity, where various types of technologies (including project management software as well as software to support group collaboration) are an inherent part of the project management process. This course also acknowledges that project management involves both the use of resources from within the firm, as well as contracted from outside the organization. Prerequisite: Senior standing or approval of department chair.

CIS 4352. Structured Query Language. 3 Credit Hours.
Study relational database schema, formulating queries and sub-queries of varying complexity, embedding query statements in a "host" language, and defining and querying data views. Prerequisite(s): CIS 4301 or permission of department chair.
CIS 4360. Strategic Information Systems. 3 Credit Hours.
(WI) This course will explore necessary management actions, which will ensure that information is available, correct, manipulable, protected, and archived in proper forms to allow for a strategic use of information systems in the enterprise. Throughout this course we will review a set of conceptual frameworks of IT management, and by developing a critical view of two levels of IT management -- strategic and tactical. We will address the value/importance of IT from strategic and tactical perspectives, and the IT management challenges of managing people, processes and technology. Prerequisite(s): Senior Standing or CIS 4350 or Permission of Department Chair.

CIS 4375. Professional Senior Seminar. 3 Credit Hours.
Participate in professional organizations, current events, research and presentations, job market analysis, interviewing, and resume preparation, in order to prepare for the professional certification exam. Prerequisite(s): 24 hours of CIS courses.

CIS 4376. Network Administration. 3 Credit Hours.
Study communications architectures, protocols, and interfaces as related to network operating systems. Examine communications networking techniques, such as DHCP and DNS server configuration and internet working. Examine industry standards in networking. Special emphasis on installation, configuration, client handling, basic security, and troubleshooting of a network operating system. Use a modern network operating system in order to gain experience in configuration and administration of a network. Lab fee $95. Prerequisite(s): CIS 3347 or permission of department chair.

CIS 4378. Comprehensive Networking. 3 Credit Hours.
A course requiring the student to learn details of various networking protocols and engage in analyzing and designing various computer network applications. Specifically, the course will focus on the OSI and TCP/IP networking protocols, including subnetting of IP address, local area networking (LAN), wide area networking (WAN) and network analysis. This course includes hands-on exercises on various networking layer messages on live web traffic and explore them to understand overall networking process. Lab fees: $95. Prerequisite(s): CIS 3347 or permission of department chair.

CIS 4379. Software Engineering for E-Business. 3 Credit Hours.
(WI) This course examines the linkage of organizational strategy and electronic methods of delivering products, services and exchanges in inter-organizational, national, and global environments. Information technology strategy and technological solutions for enabling effective business processes within and between organizations in a global environment are considered. Students study a software life-cycle model, fundamental software engineering principles, and documentation standards in detail. An E-Business team project is required, which emphasizes the production of high quality software for medium and larger scale projects. Prerequisite(s): (CIS 3340 or CIS 3341 or CIS 3342) and senior standing.

CIS 4380. Software Engineering. 3 Credit Hours.
Examine the production of high quality software for medium and larger scale projects. Explore theoretical software engineering research as the basis for a practical approach to developing quality software. Special emphasis on the software life-cycle model, fundamental software engineering principles, and documentation standards in detail. Prerequisite(s): CIS 3340 or CIS 3341 or CIS 3342 or CIS 3343 and senior standing.

CIS 4384. Internship in Computer Information Systems. 3 Credit Hours.
Gain practical work experience as a programmer/programmer analyst. Apply the principles, concepts, and skills learned during the first three years of collegiate training to the field of computer information systems. May be repeated for credit. Prerequisite(s): Permission of internship coordinator or department chair. Field experience fee $75.

CIS 4388. Computer Information Systems Problems. 1-3 Credit Hours.
Explore selected topics in business on technical computer applications, practicum, field project, or other suitable computer studies. Prerequisite(s): Varies with topic or Permission of department chair.

CIS 5090. Computer Information Systems Comprehensive Examination. 0 Credit Hours.
Prepare for and take the CIS comprehensive exam. Students should take this exam in their last semester, their second to last semester, or when all the core classes have been taken. Students taking the thesis option do not need to take this exam.

CIS 5302. Object Oriented Programming. 3 Credit Hours.
This course covers the concepts of object-oriented approach to software design and development. It includes a detailed discussion of programming concepts starting with the fundamentals of data types, control structures, arrays, classes and proceeding to advanced topics such as inheritance and polymorphism, creating user interfaces, and exceptions. Upon completion of this course the students will be able to design and implement applications.

CIS 5304. Data Communications for Managers. 3 Credit Hours.
Examine the management and utilization of data communication technologies including technical components, configurations, applications, protocols, legal issues, software and management issues, Local Area Network (LAN) technologies, and security issues. Upon completion of this course, the students will be able to evaluate, select, and implement different data network options.

CIS 5307. Advanced Systems Analysis and Design. 3 Credit Hours.
Examine system analysis and design processes. Students will be introduced to comparative development methodologies and modeling tools including project management and cost-benefit analysis; information systems planning and project identification and selection; requirements collection and structuring; process modeling; conceptual and logical data modeling; database design and implementation; design of the human-computer interface; system implementation; system maintenance and change management.

CIS 5311. Management Information Systems. 3 Credit Hours.
Study the management and use of information and technology as a resource to create competitive organizations, manage global operations, provide useful products and quality services. Examine intellectual property, privacy, organizational and societal impact, legal issues, ethics, security issues, decision making, strategic information systems, and organizational support systems.

CIS 5312. Technology Support Management Operations. 3 Credit Hours.
Study issues of organizing and staffing a technical support help desk. Explore the numerous management techniques and operational concepts that businesses and governmental organizations use to manage successful technical support activities. Survey the wide array of commercially available technical support software, and work with the public to deliver technical support in an operational environment.
CIS 5316. Advanced Database Management. 3 Credit Hours.
Examine the methodologies of database management including data models, database design, normalization, SQL/PLSQL, NoSQL, performance and reliability, distributed database, data dictionaries, data integrity, security, and privacy.

CIS 5318. Quantitative Concepts. 3 Credit Hours.
Examine and apply measurement techniques to information technology related problems. Use a statistical program to analyze data, and perform analyses of programs and selected algorithms.

CIS 5319. Business Intelligence Systems. 3 Credit Hours.
Examine the fundamentals of Business Intelligence including concepts, techniques and applications. Special emphasis on Decision Support Systems and other collaborative systems, Data Management, Data Mining, Data Visualization, Expert Systems and Intelligent Systems.

CIS 5320. Information Systems Seminar. 3 Credit Hours.
Explore selected topics in information systems. Topics will vary. May be repeated once for credit as topics vary.

CIS 5325. Unified Modeling Language. 3 Credit Hours.
This course covers Systems Development Life Cycle using the Unified Modeling Language (UML) in an object-oriented software system environment. Topics include modeling the elements, structure, and behaviors of object-oriented software systems using UML. Upon completion of this course, students will be able to use UML to identify objects and classes, capture requirements and define use cases, to extend and enhance visual models, and model the details of object behavior with activity and state-chart diagrams.

CIS 5344. Scripting Languages for Web Design. 3 Credit Hours.
This course is a study of Web Scripting languages and will cover many aspects of creating dynamic Web Sites using server-side and client-side scripting. It will also delve into interactions between Web Sites and a database.

CIS 5345. Extensible Markup Language. 3 Credit Hours.
Study well-formed XML and validated XML documents and the language facilities for working with hierarchical data. Describe and transform XML data to an external presentation using real world problems.

CIS 5349. Topics in Programming. 3 Credit Hours.
Develop programming proficiency in a modern programming language. Undertake multiple programming assignments to achieve necessary knowledge and skills. May be repeated once for credit as topics vary. Prerequisite(s): Varies with Topic.

CIS 5351. Information Technology Project Management. 3 Credit Hours.
Study the concepts and practices of project management and its importance to improving the success of information technology projects. Utilize project management concepts and techniques within group projects, as a project manager or active team member. Topics include techniques for planning, organizing, scheduling, and controlling information systems projects.

CIS 5353. Big Data Analytics and Management. 3 Credit Hours.
Study fundamental concepts and principles of Big Data Analytics and its role in supporting/enhancing organizational decision making and predictions. Special emphasis on Big Data, trends, challenges and applications, analytic methods, tools, technologies, infrastructure and strategies for Big Data Management, data Privacy and Ethics. Prerequisite(s): CIS 5311 or permission of department chair.

CIS 5354. Advanced Methods in Big Data Analytics. 3 Credit Hours.
Study advanced concepts and principles of Big Data Analytics and its role in supporting/enhancing organizational decision making and predictions. Special emphasis on NoSQL Databases, Hadoop Ecosystem, MapReduce, Pig, Hive, Natural Language Processing, Social Network Analysis, and Data Visualization. Prerequisite(s): CIS 5353, Java Programming or permission of department chair.

CIS 5356. Web Development. 3 Credit Hours.
Examine theory and application of the multimedia application development process. Develop the web-based authoring and scripting tools, to use in the creation of various types of web-based projects. Special emphasis on the planning, design, projection, and evaluation of interactive web-based projects for delivery through a variety of media.

CIS 5370. Foundations of Information Security. 3 Credit Hours.

CIS 5376. Network Administration and Design. 3 Credit Hours.
This course explores network design, installation planning, and preparation. Topics include installing network operating system; establishing network security and services; exploring network administration, network utilities, maintenance techniques; monitoring performance; troubleshooting and configuring the network.

CIS 5380. E-Business Application Development. 3 Credit Hours.
This course provides an in-depth knowledge of systematic approach to analyze digital markets. Upon completion of this course, students will be able to design and implement an e-business project integrating database, and scripting languages. Prerequisite: CIS 5316 or perm of Chair.

CIS 5381. Research Project with Laboratory. 3 Credit Hours.
Engage in independent study in selected topics in Information Systems. May be repeated for credit once when topics change. Prerequisite(s): Varies with topic.

CIS 5382. Research Methods in Computer Information Systems. 3 Credit Hours.
This course provides an overview of research problems and techniques in information systems. Upon completion of this course, students will be able to formulate a research question; conduct a literature survey; select appropriate research methods to answer their research questions; collect and analyze data.

CIS 5384. Computer Information Systems Internship. 3 Credit Hours.
Engage in supervised professional experience in an information technology-related position with a public or private organization. May be repeated for a total of 6 hours credit. Prerequisite(s): 6 semester hours of CIS courses or equivalent and permission of internship coordinator or department chair. Field experience fee $75.

CIS 5388. Computer Information Systems Problems. 1-3 Credit Hours.
Study selected topics in CIS and perform research within the student’s area of interest as directed by the responsible professor. May be repeated as topics vary for a maximum of 6 semester hours. Prerequisite(s): Varies with topic.

CIS 5389. Special Topics in Computer Information Systems. 3 Credit Hours.
Study selected current topics in computer information systems. May be repeated once for credit as topics vary. Prerequisite(s): Varies with topic.
CIS 5398. Computer Information Systems Thesis. 1-6 Credit Hours.
Prepare and write the information systems thesis. Scheduled when the student is ready to begin the thesis. No credit until the thesis is accepted. Prerequisite(s): CIS 5382, 18-hours.