# Information Systems and Technology

Information Systems and Technology (IST) students complement coursework in information technology (IT) with coursework in Business Administration to gain a solid foundation in the social and technical design, development, implementation, and management of information systems. Their strength lies in the ability to apply their knowledge of IT and Business to help organizations streamline their business processes and gain strategic advantage by enabling alignment of IT plans with business plans.

UMSL's IST students are thus well-versed in varied technology landscapes as well as in sustaining and disruptive information technologies through specialized coursework in Business Intelligence, Cybersecurity, Financial Technology, IT Auditing and Legacy Systems. With strong business and communication skills, they make an immediate impact on the organizations they join after graduating from UMSL. Job roles they are employed in include application developer, business analyst, business process designer, chief information officer, cybersecurity analyst, database designer, helpdesk manager, IT manager, network administrator, pen tester, systems administrator, and web designer, among others.

To reinforce understanding of successful practices in the use and management of IT, the IST faculty constantly challenge and engage students through opportunities such as hackathons, game jams, immersion days, conferences, competitions, and student clubs.

Choosing IST as a major or a minor is a smart move for any student's career. For more information, please visit the department's website: http://ist.umsl.edu or contact the department chair, Dr. Dinesh Mirchandani at mirchandanid@umsl.edu or 314-516-7354.

## Undergraduate Degrees

Business Administration BSBA, Information Systems and Technology Emphasis

Cybersecurity BS, Information Systems Emphasis

Information Systems and Technology BS

**Graduate Degrees**

Cybersecurity MS, Information Systems Emphasis

Information Systems and Technology MS

Information Systems MS Accelerated Master's Program

Business Administration MBA, Information Systems Emphasis

## Minors

Cybersecurity Minor

Information Systems and Technology Minor

## Certificates

Business Intelligence Graduate Certificate

Enterprise Systems Development Graduate Certificate

Information Security Management and Auditing Graduate Certificate

Information Systems and Technology Graduate Certificate

## Affiliated Interdisciplinary Programs

Cybersecurity Undergraduate Certificate

Cybersecurity Graduate Certificate

## Courses

***INFSYS 1800 Computers and Information Systems: 3 semester hours***
This course develops skills in technology awareness, computer fluency, computing devices, ethical use of the Internet, and business applications for problem solving, communicating, and making informed decisions, including word processors, presentation software, electronic spreadsheets, and database management systems. Students will gain skills in developing business applications and web pages. Credit cannot be granted for both CMP SCI 1010 and INFSYS 1800.

***INFSYS 2800 Information Systems Concepts and Applications: 3 semester hours***
Prerequisites: INFSYS 1800 or satisfactory performance on proficiency exam. This course provides an overview of the field of information systems including concepts of systems analysis and design, ethics in information systems usage, electronic business, database management, enterprise systems, information security, and JavaScript programming concepts. Business cases will be utilized to illustrate how information systems improve decision-making. Students will also gain valuable strategies for career development and networking.

***INFSYS 3806 Managerial Applications of Object-Oriented Programming I: 3 semester hours***
Prerequisites: INFSYS 2800 or CMP SCI 1250, and a minimum campus GPA of 2.0. This course provides an introduction to object-oriented programming. Topics include object-oriented design principles and choices, encapsulation, inheritance, and event-driven programming. Hands-on labs during class sessions and assignments help students develop applied programming skills. Students may not receive credit for both INFSYS 3806 and INFSYS 6806.

***INFSYS 3807 Legacy Systems: 3 semester hours***
Prerequisites: A minimum campus GPA of 2.0. This course covers structured programming techniques for legacy business applications. Students will learn COBOL syntax, structure, design and best programming practices to create, maintain, debug, compile and execute COBOL programs.

***INFSYS 3810 Information Systems Analysis: 3 semester hours***
Prerequisites: INFSYS 3816, minimum campus GPA of 2.0; or consent of instructor. In this course, students will learn how to identify, evaluate, and document business systems using traditional and agile methodologies. This includes how to study systems' ability to meet the business needs and information requirements of an organization, and defend alternatives that better meet needs. Students will conduct a systems analysis of an actual organization in project teams, including the identification of and defense of alternatives.

***INFSYS 3815 Object-Oriented Applications in Business: 3 semester hours***
Prerequisites: INFSYS 3806 and a minimum campus GPA of 2.0. This course provides a study of web application development using Java and JavaScript. Students will learn about Java Collections Framework, Spring, Hibernate, design patterns, software testing, and front-end web technologies. Credit cannot be granted for both INFSYS 3815 and INFSYS 6815.

***INFSYS 3816 Managerial Application of Object-Oriented Programming II: 3 semester hours***
Prerequisites: INFSYS 3806 and a minimum campus GPA of 2.0. This course builds on skills learned in INFSYS 3806 and focuses on contemporary client-server development environments and tools. Topics include database integration, web applications, and web services. Students will be provided hands-on application development experiences during class and in assignments.

***INFSYS 3817 Advanced Legacy Systems: 3 semester hours***
Prerequisites: INFSYS 3807 or consent of instructor. This course will build upon Contemporary z/OS COBOL 1. Topics may include JCL, file management, utilities/tools (like SORTING, File-Aid, IEB's, JCLCheck), file access (VSAM, DB2, and Sequential), scheduling, debugging, testing, and mainframe-server communication protocols. Students will be prepared for leadership roles in managing IT landscapes consisting of both legacy and modern systems. Credit cannot be granted for both INFSYS 3817 and INFSYS 6817.

***INFSYS 3818 Management of Software Testing: 3 semester hours***
Prerequisites: INFSYS 3806 or INFSYS 3844 or consent of instructor. This course provides the core concepts of the lifecycle of Software Assurance, Quality Control and Testing. It will emphasize the importance of testing strategies, methodologies, planning, design, staging, reporting and managing defects, test environment management and Test Driven Development. Credit cannot be granted for both INFSYS 3818 and INFSYS 6818.

***INFSYS 3820 Introduction to Systems Administration: 3 semester hours***
Prerequisites: INFSYS 2800 or CMP SCI 1250 or permission of Information Systems department chair. This course provides an overview of modern Information Technology (IT) infrastructure components and focuses on systems administration in Linux and Windows server environments. Students will learn to install, configure, operate, maintain, and secure servers. Topics include user management and policies, file systems, backup and recovery, network configuration, and host security among others. Virtualization and cloud environments are introduced. Basic foundations of automation and configuration management using shells and other contemporary tools are provided. Credit cannot be granted for both INFSYS 3820 and INFSYS 6820.

***INFSYS 3830 Data Programming: 3 semester hours***
Prerequisites: A minimum campus GPA of 2.0 or consent of instructor. In this course, students will learn the fundamentals of data programming with R and Python using structured (tabular data such as spreadsheets) and unstructured data (text data such as social media) for application in Business and Cyber Analytics, Machine Learning, and Artificial Intelligence. Credit cannot be granted for both INFSYS 3830 and INFSYS 6830.

***INFSYS 3841 Enterprise Information Systems: 3 semester hours***
Prerequisites: INFSYS 2800 and a minimum campus GPA of 2.0. This course provides students the skills and knowledge needed for roles as ERP business analysts, ERP configuration specialists, and consultants. Students will be introduced to integrated business processes through the application of SAP modules supporting Sales and Distribution (SD), Materials Management (MM), Financial Accounting (FI), Production Planning (PP), and Controlling (CO) as components of the SAP integrated business solution. Students will complete exercises to construct a functioning company operating in an integrated SAP R/3 environment.

***INFSYS 3842 Data Networks and Security: 3 semester hours***
Same as INTL BUS 3882. Prerequisites: INFSYS 2800 and a minimum campus GPA of 2.0; or consent of instructor. This is a foundational course in data networking and network security. It covers the fundamentals of networking and security implications of data networks with hands-on exercises. Topics include networking layers and standardization of functionality across layers, wired and wireless Local Area Networks (LANs) along with switching and physical layer technologies, Internetworking, supporting and supervisory protocols; application layer protocols such as HTTP, and fundamentals of network security. Students will also learn about network protocol analyzers such as Wireshark, virtualization, and networking in virtual environments. Credit cannot be granted for both INFSYS 3842 and INFSYS 6836. Course satisfies/fulfills the College of Business Global Awareness requirement.

***INFSYS 3843 Decision Support Systems for Business Intelligence: 3 semester hours***
Prerequisites: SCMA 3300 and a minimum campus GPA of 2.0. This class examines the applications of data and analytics (models) to support the needs of decision makers. Descriptive, predictive and prescriptive analytics tools are coupled with Big Data and well-designed user interfaces to provide the necessary tools. Topics such as how to construct the data warehouse, how to clean and store data in the appropriate form, how to construct and implement a useful visualization of data, and how to construct and support decision makers are included. DSS component design in response to decision making and business intelligence needs are discussed.

***INFSYS 3844 Developing Business Applications in .NET: 3 semester hours***
Prerequisites: INFSYS 2800 or CMP SCI 2250, and a minimum campus GPA of 2.0. This course will enable students to design, implement, and debug object-oriented and data driven business applications in C#.NET. Students will learn application design choices, object-oriented design principles, event-driven programming, user interface programming, user interface controls, data binding and database access, exception handling, debugging and effective ways of working with C#.NET.

***INFSYS 3845 Database Management Systems: 3 semester hours***
Prerequisites: INFSYS 3806, ACCTNG 2400, minimum campus GPA of 2.0. This course provides an introduction to the design and use of databases in meeting business information needs. Topics include database planning, conceptual design, and data administration. The concepts are studied with projects involving the use of a current database management system.

***INFSYS 3847 Web Design: 3 semester hours***
Prerequisites: INFSYS 2800 and a minimum campus GPA of 2.0. This course focuses on website planning, design, and construction. Topics include site structure, navigation, content management, markup languages, CSS, scripting languages, and important tools, libraries and frameworks.

***INFSYS 3848 Introduction to Information Security: 3 semester hours***
Prerequisites: INFSYS 2800 or CMP SCI 2250 or consent of instructor and a minimum campus GPA of 2.0. This course provides an introductory survey of the vast field of Information Security (InfoSec). It intersects both management and technical aspects of security as relevant to organizations, governments, individuals, and society. Topics include fundamental principles of InfoSec and cyber defense, the threat environment, management of InfoSec in organizations, technologies and tools in InfoSec, cryptology/cryptography, web application security, and current issues. Hands-on labs expose students to basics of penetration testing, applications of cryptography, and vulnerability management. Course is open to all majors. Credit cannot be granted for both INFSYS 3848 and INFSYS 6828. Course satisfies/fulfills the College of Business Global Awareness requirement.

***INFSYS 3858 Advanced Security and Information Systems: 3 semester hours***
Prerequisites: INFSYS 3848 or consent of department chair. This course builds upon the principles of information security. It covers topics ranging from networking, penetration testing, formal verification of systems, formal models of information flow and protection, distributed system authentication, protocol design and attack, computer viruses and malware, as well as intrusion and anomaly detection models. Students are exposed to virtualization, defensive security, offensive security, and other forms of cybersecurity. Credit cannot be granted for both INFSYS 3858 and INFSYS 6858.

***INFSYS 3860 Data Integration: 3 semester hours***
Prerequisites: INFSYS 2800 or consent of instructor. This course discusses the theories and techniques for blending unstructured and structured data including big data and social media streams with relational databases, data warehouses, spreadsheets, and other sources of data. It provides hands-on experience in integrating data from diverse sources, screening and cleaning it, and producing descriptive and visual summaries in tables, graphs, maps, and text for business intelligence. Students will be introduced to tools that integrate data from different sources and provide input to dashboards for rich visualization and advanced analytics. Students may not receive credit for both INFSYS 3860 and INFSYS 6860.

***INFSYS 3862 Artificial Intelligence Applications for Business: 3 semester hours***
Prerequisites: INFSYS 3830 or consent of instructor. This course introduces students to topics in Artificial Intelligence (AI) and its applications in Business and Cybersecurity. The course discusses the history of AI and delves into Machine Learning (ML) and its general methodology of development of data models. The course provides a sampling of successful applications of AI and ML in different areas of Business such as portfolio management, algorithmic trading, fraud analytics, and credit scoring. Credit cannot be granted for both INFSYS 3862 and INFSYS 6862.

***INFSYS 3864 Applied Cryptography for Business: 3 semester hours***
Prerequisites: INFSYS 3806 and INFSYS 3848, or consent of instructor. This course provides an overview of the building blocks of contemporary cryptographic solutions to address information security needs in organizations. The focus will be on understanding cryptographic primitives and applying them to assure confidentiality, integrity, authentication, and non-repudiation among other information security goals. Using best practices, students will work on projects aimed at evaluating, selecting, and implementing an appropriate mix of cryptographic solutions given particular application domains. Application areas in traditional as well as cloud-based information technology environments will be considered. Credit cannot be granted for both INFSYS 3864 and INFSYS 6864.

***INFSYS 3866 Cloud Security for Business: 3 semester hours***
Prerequisites: INFSYS 3843 or INFSYS 3848 or consent of instructor. This course covers the fundamentals of cloud security in public cloud computing environments with a focus on business applications. Topics include identity and access management, secure configuration of cloud services, and various security focused cloud services. Data collection and analysis of cloud-based data logging services to aid in security auditing and compliance is covered. Emerging topics, such as use of artificial intelligence-based services and tools in cloud security are also discussed. Student may not receive credit for both INFSYS 3866 and INFSYS 6866.

***INFSYS 3868 Secure Software Development: 3 semester hours***
Prerequisites: A first course in programming such as INFSYS 3806 or CMP SCI 2250 or consent of instructor. This course covers the concepts of software assurance and the fundamentals of the secure software lifecycle as it relates to software development. Students will experience the secure software lifecycle process by developing concrete artifacts and practicing in a lab environment. Credit cannot be granted for both INFSYS 3868 and INFSYS 6868.

***INFSYS 3878 Information Security Risk Management and Business Continuity: 3 semester hours***
Prerequisites: INFSYS 3848 or consent of Instructor. This course provides students the tools and concepts necessary to plan for, prevent, and when needed successfully respond to disruptions in business operations. Topics covered include security policies, frameworks, information and materials management, risk management, and regulatory compliance. Credit cannot be granted for both INFSYS 3878 and INFSYS 6878.

***INFSYS 3890 Internship in Information Systems: 1-3 semester hours***
Prerequisites: Minimum business GPA of 2.5, minimum campus GPA of 2.0, completed and/or currently enrolled in at least 6 credit hours of information systems electives at the 3000 level or above, consent of supervising instructor, and consent of department chair. Students are employed in the field of information systems where they apply the knowledge and skills learned in the classroom. Professional development obtaining specialized work experience are primary goals. An information systems faculty member will monitor the student's program with the student providing a formal written report at the end of the project.

***INFSYS 3898 Seminar in Information Systems: 1-3 semester hours***
Prerequisites: To be determined each time course is offered and to include a minimum 2.0 overall GPA. This course is a selected special topic in the field of information systems. May be repeated for credit with different topics.

***INFSYS 3899 Independent Study in Information Systems: 1-3 semester hours***
Prerequisites: Minimum campus GPA of 2.0 and approval by the supervising professor and the Area Coordinator. Special individual study in information systems under the supervision of a full-time information systems faculty member.

***INFSYS 4800 IT Leadership: 3 semester hours***
Prerequisite: INFSYS 2800. This course seeks to prepare students for IT leadership roles using business cases as exemplars. Credit cannot be granted for both INFSYS 4800 and INFSYS 5800.

***INFSYS 4847 IT Project Management: 3 semester hours***
Prerequisites: INFSYS 2800 or consent of instructor. Effective project management ensures that a project is completed on time, within budget, and includes the necessary scope. This course explores the project management processes shared by all projects: project selection, planning, control, and closing. Traditional and Agile project management techniques will be explored in the contexts of Information Technology and Supply Chain Management. Credit cannot be granted for both INFSYS 4847 and INFSYS 6847.

***INFSYS 4850 Information Systems Design: 3 semester hours***
Prerequisites: INFSYS 3810, INFSYS 3816, INFSYS 3845 and a minimum campus GPA of 2.0. This course builds on the skills learned in INFSYS 3810. System design, implementation, and methods of systems installation and operation are presented. A system development project is required.

***INFSYS 5800 Management Information Systems: 3 semester hours***
Same as P P ADM 6800. Prerequisites: Graduate standing. This course provides an overview of issues related to the management of information systems within organizations. Course topics may include the role of the Chief Information Officer, business value from emergent information technologies (IT), enterprise systems, the impact of IT on organizational competitiveness, managing IT-enabled projects, extracting business intelligence from big data, sourcing IT, cybersecurity, ethics, intellectual property rights, and societal impacts of IT.

***INFSYS 5890 Graduate Internship in Information Systems: 1-6 semester hours***
Prerequisites: INFSYS 6840 or permission of instructor. The internship will be a supervised field experience in a US-based business/organization or a US-based international business/organization. Students will be employed off-campus for a 10-16 week period on projects directed by host organization supervisors in consultation with a UM-St. Louis faculty member. The project requires students to apply IS concepts to a real-world problem. The project does not duplicate, but builds upon material in the IS curriculum. A professional written report will be required.

***INFSYS 5899 Individual Research in Information Systems: 1-3 semester hours***
Prerequisites: Consent of instructor and graduate director. Special individual research topics in Information Systems under the guidance of a specific professor.

***INFSYS 6805 Applications of Programming for Business Solutions: 3 semester hours***
Prerequisite: Graduate standing. This course will enable students to design, implement, and debug object-oriented and data driven business applications in C#.NET. Students will learn application design choices, object-oriented design principles, event-driven programming, user interface programming, user interface controls, data binding and database access, exception handling, debugging and effective ways of working with C#.NET.

***INFSYS 6806 Managerial Applications of Object-Oriented Technologies: 3 semester hours***
Prerequisites: Graduate Standing. This course provides an introduction to object-oriented programming. Topics include object-oriented design principles and choices, encapsulation, inheritance, and event-driven programming. Hands-on labs during class sessions and assignments help students develop applied programming skills. Students may not receive credit for both INFSYS 3806 and INFSYS 6806.

***INFSYS 6807 Contemporary z/OS COBOL: 3 semester hours***
Prerequisites: Graduate standing. This course covers structured programming techniques for legacy business applications. Students will learn COBOL syntax, structure, design and best programming practices to create, maintain, debug, compile and execute COBOL programs.

***INFSYS 6808 Advanced Object-Oriented Programming for Business: 3 semester hours***
Prerequisite: INFSYS 6806. This course builds on skills learned in INFSYS 6806 and focuses on contemporary client-server development environments and tools. Topics include database integration, web applications, and web services. Students will be provided hands-on application development experiences during class and in assignments.

***INFSYS 6814 Web Applications for Business: 3 semester hours***
Prerequisites: Graduate standing. This course focuses on website planning, design, and construction. Topics include site structure, navigation, content management, markup languages, CSS, scripting languages, and important tools, libraries and frameworks.

***INFSYS 6815 Advanced Web Applications for Business: 3 semester hours***
Prerequisites: INFSYS 6806 and INFSYS 6814 or consent of instructor. This course provides a study of web application development using Java and JavaScript. Students will learn about frameworks, design patterns, software testing, and front-end web technologies. Students may not receive credit for both INFSYS 3815 and INFSYS 6815.

***INFSYS 6817 Advanced COBOL and Modern z/OS System Tools: 3 semester hours***
Prerequisites: INFSYS 6807 or consent of instructor. This course will build upon Contemporary z/OS COBOL 1. Topics will include JCL, file management, utilities/tools (like SORTING, File-Aid, IEB's, JCLCheck), file access (VSAM, DB2, and Sequential), scheduling, debugging, testing, and mainframe-server communication protocols.

***INFSYS 6818 Management of Software Testing: 3 semester hours***
Prerequisites: INFSYS 6805 or INFSYS 6806 or consent of instructor. This course provides the core concepts of the lifecycle of Software Assurance, Quality Control and Testing. It will emphasize the importance of testing strategies, methodologies, planning, design, staging, reporting and managing defects, test environment management and Test Driven Development.

***INFSYS 6820 Systems and IT Infrastructure: 3 semester hours***
Prerequisites: Graduate standing. This course establishes the critical role of Linux and Windows server environments in contemporary Information Technology (IT) infrastructure management. Students will explore both the technical and management aspects of server infrastructure. Technical aspects include installation, operation, maintenance, virtualization, and systems security. Management aspects include server lifecycles and management of server environments at scale using automation and configuration management tools within the context of application development, security operations, and IT operations. Credit cannot be granted for both INFSYS 3820 and INFSYS 6820.

***INFSYS 6828 Principles of Information Security: 3 semester hours***
Prerequisites: Graduate standing. This course is a survey of the vast field of Information Security (InfoSec). It intersects both management and technical aspects of security as relevant to organizations, governments, individuals, and society. Topics covered include fundamental principles of InfoSec and cyber defense, the threat environment, management of InfoSec in organizations, technologies and tools in InfoSec, cryptology/cryptography, web application security, vulnerability management, and current issues. Hands-on labs expose students to basics of penetration testing, applications of cryptography, and vulnerability management. A graduate research paper is required. This course is open to all majors. Credit cannot be granted for both INFSYS 6828 and INFSYS 3848.

***INFSYS 6830 Data Programming for Business Intelligence: 3 semester hours***
Prerequisites: Graduate standing. This course introduces students to the fundamentals of data programming with R and Python using structured (tabular data such as spreadsheets) and unstructured data (text data such as social media) for application in business and cyber analytics, machine learning, and artificial intelligence. Students may not receive credit both INFSYS 3830 and INFSYS 6830.

***INFSYS 6833 Decision Support Systems for Business Intelligence: 3 semester hours***
Prerequisites: SCMA 5300. This course examines the applications of data and analytics (models) to support the needs of decision makers. Descriptive, predictive and prescriptive analytics tools are coupled with big data and well-designed user interfaces to provide the necessary tools. Topics such as how to construct the data warehouse, how to clean and store data in the appropriate form, how to construct and implement a useful visualization of data, and how to construct and support decision makers are included. DSS component design in response to decision making and business intelligence needs are discussed. Credit cannot be granted for both INFSYS 3843 and INFSYS 6833.

***INFSYS 6836 Management of Data Networks and Security: 3 semester hours***
Prerequisites: Graduate standing. This course focuses on the big-picture implications and challenges of data networking and network security within contemporary Information Technology environments. It covers fundamentals of networking and security implications of data networks with hands-on exercises. Topics include networking layers and standardization of functionality across layers, wired and wireless Local Area Networks (LANs) along with switching and physical layer technologies, Internetworking, supporting and supervisory protocols, application layer protocols, network design and management, and fundamentals of network security. Students will also learn about network protocol analyzers such as Wireshark, virtualization, networking in virtual environments; and how some common networked applications operate by utilizing the networking infrastructure. Credit cannot be granted for both INFSYS 6836 and INFSYS 3842.

***INFSYS 6838 Business Processes: Design, Management and Integration: 3 semester hours***
Prerequisite: INFSYS 5800. Business design methodologies are used to create new, or improve existing processes. Examples of business processes include: call centers, order-flow processing in financial services, manufacturing, hospital emergency services, and more. Special attention is paid to the role of information technology during the design process. Specific business process design methods we will cover are: SIPOC (supplier-input-process-output-customer), Process Flow Mapping, Simulation Modeling, Performance Scorecards, Quality Functional Deployment, Failure Mode and Effects Analysis, and Theory of Constraints. Case studies are used to illustrate the concepts and guest speakers will discuss their applications of the latest business process design methods and software.

***INFSYS 6840 Information Systems Analysis: 3 semester hours***
Prerequisite: INFSYS 6805 or INFSYS 6806. In this course, students will learn how to identify, evaluate, and document business systems using traditional and agile methodologies. This includes how to study systems' ability to meet the business needs and information requirements of an organization, and defend alternatives that better meet needs. Students will conduct a systems analysis of an actual organization in project teams, including the identification of and defense of alternatives.

***INFSYS 6845 Database Management Systems: 3 semester hours***
Prerequisites: INFSYS 5800 and either INFSYS 6805 or INFSYS 6806. This course provides an introduction to the design and use of databases in meeting business information needs. Topics include database architecture, design, administration, and implementation. The concepts are studied with projects involving the use of a current database management system.

***INFSYS 6847 Project Management: 3 semester hours***
Prerequisite: INFSYS 5800. Effective project management ensures that a project is completed on time, within budget, and has high quality. The purpose of this class is to examine the task of project resource management with a focus on IT and services. It will cover conventional aspects of project management, such as the project evaluation, planning, roles, responsibilities, scheduling, and tracking. In addition, this class will examine risk management, change management, critical chain management, build vs. buy analysis, package vs. custom solutions, vendor qualification and selection, and the roles of certification in the process. The class will also cover the management of programs or a portfolio of IT projects.

***INFSYS 6849 Data Warehouse Design and Implementation: 3 semester hours***
Prerequisites: INFSYS 6845 or consent of instructor. Course will cover different design configurations for structuring and organizing data in a data warehouse. Formal methodologies for the development of data warehouses will also be discussed and implemented.

***INFSYS 6850 Information Systems Design: 3 semester hours***
Prerequisites: INFSYS 6840 and INFSYS 6845. This course builds upon the analysis techniques presented in INFSYS 6840. It requires the student, usually working in a group to design and implement a system in a real-world environment. Advanced design concepts are presented to support the students in their project work.

***INFSYS 6851 Practicum in Business Intelligence: 3 semester hours***
Prerequisites: INFSYS 6833. This course will provide the context for students to integrate, synthesize and apply their Business Intelligence skills in an actual business organization. Project work will be jointly supervised and coordinated by a faculty member and a supervisor in the relevant business organization.

***INFSYS 6858 Advanced Cybersecurity Concepts: 3 semester hours***
Prerequisites: INFSYS 6828. This course provides an in-depth examination of advanced principles of cybersecurity. A broad range of topics are covered, including penetration testing, formal verification of systems, formal models of information flow and protection, distributed system authentication, protocol design and attack, computer viruses and malware, as well as intrusion and anomaly detection models. Multi-level security architecture, active defenses, investigation and forensics, network firewalls, virtualization, anonymity and identity, mobile security, and database security models and mechanisms are also studied. The course content is largely influenced by the latest research in the field. Credit cannot be granted for both INFSYS 6858 and INFSYS 3858.

***INFSYS 6860 Advanced Data Integration: 3 semester hours***
Prerequisites: Graduate standing. This course discusses the theories and techniques for blending unstructured and structured data including big data and social media streams with relational databases, data warehouses, spreadsheets, and other sources of data. It provides hands-on experience in integrating data from diverse sources, screening and cleaning it, and producing descriptive and visual summaries in tables, graphs, maps, and text for business intelligence. Students will be introduced to tools that integrate data from different sources and provide input to dashboards for rich visualization and advanced analytics. Students may not receive credit for both INFSYS 3860 and INFSYS 6860.

***INFSYS 6862 Artificial Intelligence Applications for Business and Cybersecurity: 3 semester hours***
Prerequisite: Graduate standing. This course introduces students to topics in artificial intelligence (AI) and its applications in business and cybersecurity. The course starts with a historical development of fundamental ideas in AI and their relationship to the state of the art. The course then introduces one of the most successful branches of AI-machine learning (ML), and its general methodology of the development of data models. The course provides a sampling of successful applications of AI and ML in different areas of business such as portfolio management, algorithmic trading, fraud analytics, and credit scoring. Credit cannot be granted for both INFSYS 3862 and INFSYS 6862.

***INFSYS 6864 Applied Cryptography for Business Applications: 3 semester hours***
Prerequisites: INFSYS 6805 or INFSYS 6806, and INFSYS 6828, or consent of instructor. This course provides an overview of the building blocks of contemporary cryptographic solutions to address information security needs in organizations. The focus will be on understanding cryptographic primitives and applying them to assure confidentiality, integrity, authentication, and non-repudiation, among other security goals. Students will work on projects aimed at evaluating, selecting, and implementing an appropriate mix of cryptographic solutions, based on best practices, given particular application domains. Application areas in traditional as well as cloud-based Information Technology (IT) environments will be considered. Students will also learn about important considerations and pitfalls in managing cryptographic solutions at scale in modern IT environments. Students may not receive credit for both INFSYS 3864 and INFSYS 6864.

***INFSYS 6866 Cloud Security Management: 3 semester hours***
Prerequisites: INFSYS 6828 or INFSYS 6833 or consent of instructor. This course covers the fundamentals of cloud security in public cloud computing environments with a focus on business applications. Topics include identity and access management, secure configuration of cloud services, and security focused cloud services such as the analysis of cloud-based data logging to aid in security auditing and compliance, and new artificial intelligence-based tools. Students may not receive credit for both INFSYS 3866 and INFSYS 6866.

***INFSYS 6868 Software Assurance: 3 semester hours***
Prerequisites: INFSYS 6805 or INFSYS 6806 or consent of instructor. This course provides an overview of the vast field of software assurance. The goal is to make students aware of the fundamentals of the secure software lifecycle enabling them to apply principles of secure software development and management. The course also provides practical applications that allow the learners to experience the secure software lifecycle process by developing concrete artifacts. Credit cannot be granted for both INFSYS 6868 and INFSYS 3868.

***INFSYS 6878 Management of Information Security: 3 semester hours***
Prerequisites: INFSYS 6828. This course provides students the necessary background knowledge and skills to develop and run a systematic information security management program that is in line with organizational strategy, structure, processes, and culture. Specifically, the course introduces governance, strategy, policies, implementation, operation, evaluation, and improvement of an organization's information security to achieve business objectives and be resilient to information security threats. Credit cannot be granted for both INFSYS 6878 and INFSYS 3878.

***INFSYS 6888 Capstone in Information Security: 3 semester hours***
Prerequisites: INFSYS 6828 and one of either INFSYS 6858 or CMP SCI 5782. This course provides students an opportunity to participate in the full information security lifecycle in an applied setting using a project-based approach. Students from technical and non-technical backgrounds will work together in teams. Major tasks may include creating an information security management plan, conducting risk assessments, implementing technical and administrative controls to mitigate information security risks, and managing security operations with a focus on incident detection and response. Students may work on projects through an actual organization and demonstrate application of knowledge gained through all prior courses in the degree program. This course must be taken the last semester prior to graduation. Cannot receive credit for INFSYS 6888 and CMP SCI 5888.

***INFSYS 6891 Seminar in Information Systems: 3 semester hours***
Prerequisites: INFSYS 5800. Topics of current interest in management information systems. Topics may include international information systems, electronic commerce, decision support systems, information systems strategy, telecommunications, and information systems management.