design, 7) program design and 8) program functionality of a sub-system. A final project presentation by each student team will be required. Prerequisites: CIS 3900 and credit for CIS 4100 or enrollment in CIS 4100.

7. Elective From:
   - CIS 2020. INTRODUCTION TO PROGRAMMING. (3-3-0). An introduction to procedural programming using COBOL. Course delivery will be via an IBM enterprise server. Students will be introduced to Job Control Language (JCL). Students will analyze and program typical business-oriented problems using a modular and structured programming approach. Students will be introduced to data analysis via file structures and data fields. Prerequisite: 1030.
   - CIS 4000. ADVANCED DATABASE SYSTEMS. (3-3-0). Advanced topics and techniques of database system technology. Students will design and implement software components integral to database systems using a modern enterprise database management system (DBMS). Prerequisite: 2980.
   - CIS 4020. ADVANCED OBJECT-ORIENTED PROGRAMMING. (3-3-0). An in-depth course further exploring advanced design and programming paradigm using the Java programming language. This course emphasizes inheritance and polymorphism, abstract classes and interfaces, exception handling, file input and output, and graphical user interfaces (GUIs). Students will develop programs to solve a variety of problems in math, science, business, and gaming. Students will perform laboratory-based activities to demonstrate programming proficiency. Prerequisites: CIS 3300.
   - CIS 4040. CYBER FORENSICS. (3-3-0). This course provides an examination and analysis of advanced critical issues of computer crime. Emphasis will be placed on such advanced computer forensics science capabilities as target hardware and software, tools for data duplication, recovery, analysis, and development of pre-search or on-scene computer investigative techniques. Prerequisites: CIS 1090 or BUAD 1800 or consent of instructor.
   - CIS 4060. MOBILE APPLICATIONS DEVELOPMENT. (3-3-0). This course provides an in-depth study of mobile application development techniques to include but not limited to planning, design, development, and deployment of a working application. Students will work with industry leading mobile platforms. Prerequisite: CIS 3300.
   - CIS 4070. DATA ANALYTICS. (3-3-0). This course provides an introduction to the field of data analytics, which can be defined as the extensive use of data, statistical and quantitative analysis, exploratory and predictive models, and fact-based management to drive decisions and actions. Data analytics is explored as a process of transforming data into actions through analysis and understanding the context of organizational decision making and problem solving. This course stresses the factors that impact the performance of business decision makers and the data management and analysis methods that add value to them. The application of selected data mining techniques to business decision making situations is illustrated. Students actively participate in the delivery of this course through case and project presentations. Prerequisites: CIS 2980, CIS 3300, and BUAD 2120.
   - CIS 4100. WEB APPLICATIONS: SERVER-SIDE DEVELOPMENT. (3-3-0). The course introduces the student to the issues and practices associated with the implementation and operation of multi-tier web applications: organizational applications and databases. Students will build an interactive, dynamic, data-driven web site utilizing the PHP server-side scripting language that will interface with a MySQL database for dynamic content. Security issues will be addressed through an understanding of issues and tools involving server-side design methodologies such as session handling and validation. Students will perform laboratory-based activities to demonstrate programming proficiency. Prerequisite: CIS 2980 and CIS 3300.
   - CIS 4300. COLLABORATIVE FIELD PROJECT. (3-3-0). Practical field experience in information systems development. Project must be approved by CIS faculty prior to registration. Students are encouraged to obtain an internship with a company performing some systems analysis, database and programming experience. In the event that a formal internship is unfeasible students will participate in a collaborative real world or simulated corporate project. The real world project may be replicated by multiple teams toward a best single solution. Project must be approved by CIS Coordinator prior to registration. Prerequisite: Approval of CIS Coordinator and GPA of 2.5 in major.

Major Core Courses

1. CIS 1015. INTRODUCTION TO COMPUTER INFORMATION SYSTEMS. (3-3-0). This course provides students with an introductory overview to basic computer concepts in hardware, software, networking, security, database programming, database, mobile applications, decision support systems, and other contemporary and emerging technologies. Through the use of widely used applications and development environments, this course further explores their integration, application and impact on business and society. This course further explores the different roles in Computer Information Systems and the applicable tools and techniques required in each to help students identify a particular discipline they may desire to pursue based on their given skillset.

2. CIS 1030. INTRODUCTION TO SOFTWARE DEVELOPMENT. (3-3-0). An introduction to software development to include: an introduction to database and file concepts; an introduction to techniques and methods used in making decisions with data; and introduction to visual and object-oriented programming and design concepts. Prerequisites: BUAD 1020 or Math 1020.

3. CIS 2050. ESSENTIALS OF NETWORK DESIGN AND OPERATION. (3-3-0). Introduction of basic computer hardware and operating systems with a focus on networking. A certification examination will be required as a part of the course assignments. The student does not have to pass the certification exam to pass the course.

4. CIS 2980. DATABASE SYSTEMS. (3-3-0). Study of the design, implementation, and management of database systems in a business environment. Topics include data modeling, normalization, SQL, DML, DDL, and the utilization of a relational database management system to develop an integrated database application. A certification examination will be required as a part of the course assignments. The student does not have to pass the certification exam to pass the course.

5. CIS 3900. SYSTEMS ANALYSIS AND DEVELOPMENT. (3-3-0). A project-oriented study of the planning, analysis, design and implementation of business software systems. Prototyping and object-oriented design and analysis methodologies will be covered. Unified Modeling Language (UML) will be covered. Emphasis is on both data modeling and object modeling. Prerequisite: CIS 2980.

6. CIS 3980. INTRODUCTION TO INFORMATION SECURITY. (3-3-0). This course provides an overview of Information Security. It is designed to provide students with practical knowledge about important issues in Information Security from both the technical and administrative viewpoints, with an emphasis on the managerial implications. The course examines the significance of security in today’s information systems; the potential threats to the information security; the various technical and legal tools people use to enhance information security; and the managerial and legal implications of information security. A certification examination will be required as a part of the course assignments. The student does not have to pass the certification exam to pass the course. Prerequisites: BUAD 1800 or consent of the instructor.

Application Development Field Project

1. CIS 3020. WEB PAGE DEVELOPMENT. (3-3-0). This course provides a fundamental understanding of the tools, skills, and general design concepts required to develop web pages. Students will develop and implement web pages, modify images and create web site navigation systems. Prerequisite: CIS 1010 or CIS 2980 or BUAD 1800 or demonstrated computer fluency.

2. CIS 3300. INTERMEDIATE OBJECT-ORIENTED PROGRAMMING. (3-3-0). An intermediate course in object-oriented programming using the Java programming language. The course explores the basic constructs and syntax of the language, including data types, control statements, methods, arrays, classes, and objects. Students will develop programs to solve a variety of problems in math, science, business, and gaming. Students will perform laboratory-based activities to demonstrate programming proficiency. Prerequisite: CIS 1030.
3. CIS 4000. ADVANCED DATABASE SYSTEMS. (3-3-0). Advanced topics and techniques of database system technology. Students will design and implement software components integral to database systems using a modern enterprise database management system (DBMS). Prerequisite: 2980.

4. CIS 4020. ADVANCED OBJECT-ORIENTED PROGRAMMING. (3-3-0). An in-depth course further exploring advanced design and programming paradigm using the Java programming language. The course emphasizes inheritance and polymorphism, abstract classes and interfaces, exception handling, file input and output, and graphical user interfaces (GUIs). Students will develop programs to solve a variety of problems in math, science, business, and gaming. Students will perform laboratory-based activities to demonstrate programing proficiency. Prerequisites: CIS 3300.

5. CIS 4100. WEB APPLICATIONS: SERVER-SIDE DEVELOPMENT. (3-3-0). The course introduces the students to the issues and practices associated with the implementation and operation of multi-tier web-aware organizational applications and databases. Students will build an interactive, dynamic, data-driven web site utilizing the PHP server-side scripting language that will interface with a MySQL database server. The course covers fundamentals of web content. Security issues will be addressed through a Cloud on a metered-on-demand basis in multi-tenant environments, as well as the Cloud security model and associated challenges. Through hands-on assignments and projects, students will learn how to configure and program the various services and understand how to develop and integrate Cloud-based software applications and services built on Cloud platforms. Prerequisites: CIS 2980, 3300, and 3400.

6. CIS 4280. CLOUD COMPUTING. (3-3-0). This course provides a hands-on introductory study of Cloud concepts and capabilities across the various Cloud service models including Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). This course will familiarize students with the use of applications and processes available on the Cloud on a metered-on-demand basis in multi-tenant environments, as well as the Cloud security model and associated challenges. Through hands-on assignments and projects, students will learn how to configure and program the various services and understand how to develop and integrate Cloud-based software applications and services built on Cloud platforms. Prerequisites: CIS 2980, 3300, and 3400.

Networking & Systems Management Concentration

1. CIS 3020. WEB PAGE DEVELOPMENT. (3-3-0). This course provides a fundamental understanding of the tools, skills, and general design concepts required to develop web pages. Students will develop and implement web pages, modify images and create web-site navigation systems. Prerequisite: CIS 1030 or BUAD 1800 or demonstrated computer fluency.

2. CIS 3300. INTERMEDIATE OBJECT-ORIENTED PROGRAMMING. (3-3-0). An intermediate course in object-oriented programming using the Java programming language. The course explores the basic concepts and syntax of the language, including data types, control statements, arrays, collections, exceptions, and objects. Students will develop programs to solve a variety of problems in math, science, business, and gaming. Students will perform laboratory-based activities to demonstrate programing proficiency. Prerequisite: CIS 1030.

3. CIS 3400. TELECOMMUNICATIONS AND NETWORKS. (3-3-0). An in-depth course exploring the fundamental building blocks that form a modern network, such as protocols, topologies, hardware, and network operating systems. The course provides coverage of the most important concepts in contemporary networking, such as TCP/IP, Ethernet, wireless transmission, and security. The course will prepare students to select the best network design, hardware, and software for their environment, as well as maintain, upgrade, and troubleshoot an existing network. A certification examination will be required as a part of the course assignments. The student does not have to pass the certification exam to pass the course. Prerequisite: CIS 2050 or consent of instructor.

4. CIS 4040. CYBER FORENSICS. (3-3-0). Emphasis will be placed on such advanced computer forensics science capabilities as target hardware and software, tools for data duplication, recovery, and analysis, and development of pre-search or on-scene computer investigative techniques. Prerequisites: CIS 1090 or BUAD 1800 or consent of instructor.

5. CIS 4060. MOBILE APPLICATION DEVELOPMENT. (3-3-0). This course provides an in-depth study of mobile application development techniques to include but not limited to planning, design, development, and deployment of a working application. Students will work with industry-leading mobile platforms. Prerequisite: CIS 3300.

6. CIS 4220. NETWORK IMPLEMENTATION AND ADMINISTRATION. (3-3-0). A study of network implementation and administration in an enterprise. A certification examination will be required as a part of the course assignments. The student does not have to pass the certification exam to pass the course. Prerequisite: CIS 3400.

7. Elective from:

   • CIS 4280. CLOUD COMPUTING. (3-3-0). This course provides a hands-on introductory study of Cloud concepts and capabilities across the various Cloud service models including Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). This course will familiarize students with the use of applications and processes available on the Cloud on a metered-on-demand basis in multi-tenant environments, as well as the Cloud security model and associated challenges. Through hands-on assignments and projects, students will learn how to configure and program the various services and understand how to develop and integrate Cloud-based software applications and services built on Cloud platforms. Prerequisites: CIS 2980, 3300, and 3400.

   • CIS 4300. COLLABORATIVE FIELD PROJECT. (3-3-0). Practical field experience in information systems development. Project must be approved by CIS faculty prior to registration. Students are encouraged to obtain an internship with a company performing some systems analysis, database and programming activities. The course emphasizes the use of application of student experience in a collaborative real world or simulated corporate project. The real world project may be replicated by multiple teams toward a best single solution. Project must be approved by CIS Coordinator prior to registration. Prerequisite: Approval of CIS Coordinator and GPA of 2.5 in major.

Decision making situations is illustrated. Students actively participate in the delivery of this course through project design and implementation software components integral to database systems using a modern enterprise database management system (DBMS). Prerequisite: 2980.

• CIS 4080. CLOUD COMPUTING. (3-3-0). This course provides a hands-on introductory study of Cloud concepts and capabilities across the various Cloud service models including Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). This course will familiarize students with the use of applications and processes available on the Cloud on a metered-on-demand basis in multi-tenant environments, as well as the Cloud security model and associated challenges. Through hands-on assignments and projects, students will learn how to configure and program the various services and understand how to develop and integrate Cloud-based software applications and services built on Cloud platforms. Prerequisites: CIS 2980, 3300, and 3400.

Networking & Systems Management Concentration

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3. CIS 3400. TELECOMMUNICATIONS AND NETWORKS. (3-3-0). An in-depth course exploring the fundamental building blocks that form a modern network, such as protocols, topologies, hardware, and network operating systems. The course provides coverage of the most important concepts in contemporary networking, such as TCP/IP, Ethernet, wireless transmission, and security. The course will prepare students to select the best network design, hardware, and software for their environment, as well as maintain, upgrade, and troubleshoot an existing network. A certification examination will be required as a part of the course assignments. The student does not have to pass the certification exam to pass the course. Prerequisite: CIS 2050 or consent of instructor.

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