

# Computer Information Systems

## Business, Management, Marketing and Technology

Auburn Hills and Orchard Ridge Campuses

### Associate Degrees

The Computer Information Systems (CIS) associate degrees are designed for students who need general education (e.g., communication, science, mathematics, fine arts, social science) combined with a solid foundation in the fundamental computer skills that are generally required to design, create, and test software, or analyze business system requirements and design solutions, or support and protect the operation of technology resources. These fundamental computer skills are commonly required by most four-year educational programs that offer the types of bachelor degrees most employers look for when hiring information technology professionals. All CIS courses use current computer tools and place an emphasis on practical application to provide a relevant learning environment.

Four CIS associate degree choices are available:

- Cybersecurity Option (CIS.CYS.AAS)
- Information Technology Support Option (CIS.ITS.AAS)
- Software Engineering Option (CIS.SWE.AAS)

### Certificates

The Computer Information Systems (CIS) certificates are designed for students who need specialty skills in a particular area of information technology that will help satisfy current or future employment requirements. Unlike associate degrees, certificate programs assume that students already have obtained or do not require general education skills and are now looking for education in a specific area of computer technology. Therefore, all of the courses within a certificate program are chosen to develop these specific technical skills in a shorter amount of time than what would be required in an associate degree program.

Five CIS certificate choices are available. Two of the five choices (Software Engineering and Information Technology Support) are fairly broad areas that require multiple types of focus areas within them. The courses within each focus area have been chosen to match with popular employer requirements for that particular skill type.

- Cybersecurity Certificate (CIS.CYS.CT)
- Data Science Certificate (CIS.DSC.CT)
- Information Technology Support Certificate (CIS.ITS.CT)<sup>1</sup>
  - Computer and Systems Support (focus area)
  - Database Technology and Administration (focus area)
  - Network Technology and Administration (focus area)
- Software Engineering Certificate (CIS.SWE.CT)<sup>1</sup>
  - Game Design and Development (focus area)
  - General Software Development (focus area)
  - Mobile Application Development (focus area)
  - Web Application Development (focus area)

- Web Designer Certificate (CIS.WDE.CT)
- Cisco Internetworking Certificate of Achievement (CIS.CIN.CA)

1. A separate certificate is not awarded for each focus area. For the CIS.ITS.CT program, students choose 1 of 3 focus areas. For the CIS.SWE.CT program, students choose 1 of 4 focus areas.

### Other Training Options

Professional certification preparation courses are offered through the OCC CIS department as well as the Economic and Workforce Development office. Industry exam preparation courses cover material from certifying organizations such as Microsoft, Cisco, Sun, Oracle, Novell, and CompTIA. Several exam preparation courses (e.g., CIS 1305, CIS 1310, CIS 1320, CIS 1330, CIS 1600, CIS 2434, CIS 2515, CIS 2535, CIS 2616, CIS 2980) offered for credit through the CIS department are listed in the OCC course catalog. Custom-designed non-credit courses for local businesses are also available through Workforce Development. CIS course details may be obtained by contacting the CIS department at the Orchard Ridge or Auburn Hills campus. Custom course details and related information may be obtained by contacting the Economic and Workforce Development office at (248) 232-4000 in the M-TEC building on the Auburn Hills Campus.

The M-TEC building also serves as a Pearson VUE Authorized Test Center where students can take official certification exams. Information about testing and related Economic and Workforce Development services is available within the OCC website at [www.oaklandcc.edu](http://www.oaklandcc.edu) (<http://www.oaklandcc.edu/>).

## Degrees

- Computer Information Systems - Cybersecurity Option (CIS.CYS.AAS) (<http://catalog.oaklandcc.edu/programs/computer-information-systems/cybersecurity-option-aas/>)
- Computer Information Systems - Information Technology Support Option (CIS.ITS.AAS) (<http://catalog.oaklandcc.edu/programs/computer-information-systems/tech-support-option-aas/>)
- Computer Information Systems - Software Engineering Option (CIS.SWE.AAS) (<http://catalog.oaklandcc.edu/programs/computer-information-systems/software-engineering-option-aas/>) - Traditional or online program available

## Certificates

- Computer Information Systems - Cybersecurity Certificate (CIS.CYS.CT) (<http://catalog.oaklandcc.edu/programs/computer-information-systems/cybersecurity-option-ct/>)
- Computer Information Systems - Data Science Certificate (CIS.DSC.CT) (<http://catalog.oaklandcc.edu/programs/computer-information-systems/data-science-ct/>)
- Computer Information Systems - Information Technology Support Certificate (CIS.ITS.CT) (<http://catalog.oaklandcc.edu/programs/computer-information-systems/tech-support-option-ct/>)
  - Computer Systems Support Focus Area **or**
  - Cisco Networking Technology Focus Area **or**
  - Networking Security Focus Area
- Computer Information Systems - Software Engineering Certificate (CIS.SWE.CT) (<http://catalog.oaklandcc.edu/programs/computer-information-systems/software-engineering-option-ct/>)
  - Game Design and Development Focus Area **or**
  - Full Stack Development Focus Area

- Computer Information Systems - Web Designer Certificate (CIS.WDE.CT) (<http://catalog.oaklandcc.edu/programs/computer-information-systems/web-designer-option-certificate/>)

## Computer Information Systems Courses

### **CIS 1050 Personal Computer Productivity Tools ..... 4 Credit Hours**

**Equivalent:** DPR 1030 | DPR 1010

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement into ESL 2510 or higher.

Students will be introduced to the essentials of personal computer usage. Students will explore and utilize software products such as business graphics, Internet usage, spreadsheets, databases, and word processing. Material in this course will assist students in the use of common desktop productivity tools used by most other disciplines. Refer to the specific section using OCC's online system for the software package being used. Students will be required to complete computer-based assignments inside/outside of class. BILLABLE CONTACT HOURS: 4

### **CIS 1060 Personal Computer Spreadsheet Concepts ..... 3 Credit Hours**

**Equivalent:** DPR 1060

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

Students will use a personal computer spreadsheet package to solve problems and develop solutions that lend themselves to the spreadsheet environment. Topics covered include spreadsheet menus, macros, charting, importing data files, graphics facilities, data tables and creating web pages. Refer to the specific section using OCC's online system for the software package being used. Students will be required to complete computer-based assignments inside/outside of class. BILLABLE CONTACT HOURS: 3

### **CIS 1080 Personal Computer Database Concepts ..... 3 Credit Hours**

**Equivalent:** DPR 1080

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

Students will use a personal computer database package to implement database solutions in common application areas involving personal computers. Topics covered include relational database concepts, menus, queries, report writing features, screen design, importing and exporting data files, macros and creating hyperlinks and web pages. Refer to the specific section using OCC's online system for the software package being used. Students will be required to complete computer-based assignments inside/outside of class. BILLABLE CONTACT HOURS: 3

### **CIS 1090 Web Graphic Concepts ..... 3 Credit Hours**

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

This course will introduce students to the fundamental concepts, techniques and tools for understanding, creating and manipulating graphics (image files) suitable for use on web pages. Students will learn to use a graphics editor to create image based web components such as banners, buttons, GIF animation, splash page graphics, montages and will also learn to integrate those components to create an overall interface for a website. Students will learn about file formats, image compression techniques, web page typography, color choices for web pages as well as layout and composition for web-based projects. Students will create a web-based portfolio of all the graphics created during the course of the semester. BILLABLE CONTACT HOURS: 3

### **CIS 1200 Introduction to Database Systems ..... 4 Credit Hours**

**Equivalent:** DPR 1200

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

This course will focus on the fundamentals of database systems. Students will study the basics of database vs. file management systems; functions, components, and personnel involved in a database; database, client-server, and transaction processing architectures; and relational data models and operations. Students will also study business requirements analysis, perform data definition, manipulation, and queries using basic SQL, create forms and reports; and analyze macros, procedures and triggers. Concepts of database planning, design, and administration fundamentals, data warehousing, and data mining will be covered. Students will be required to complete computer-based assignments inside/outside of class. BILLABLE CONTACT HOURS: 4

### **CIS 1300 Networking Concepts ..... 4 Credit Hours**

**Equivalent:** CIS 2710

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

Students will explore the components of networks and network designs. Communications hardware and the interconnection of servers and clients within LANs and WANs will be presented. Network architectures, standards, protocols and access methods used within intranets and the Internet will be described. The functions of network operating systems such as Windows Server and Unix/Linux will be explored. Centralized computing, client/server and peer-to-peer environments, their services and their program-to-program communication protocols will be presented. Data security and system component protection will be studied. Students will be required to complete computer-based assignments inside/outside of class. BILLABLE CONTACT HOURS: 4

### **CIS 1305 CCNA Studies I: Introduction to Networks ..... 4 Credit Hours**

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

Introduction to Networks (ITN) covers the architecture, structure, functions and components of the Internet and other computer networks. Students are provided with a basic understanding of how networks operate and how to build simple local area networks (LAN), perform basic configurations for routers and switches, and implement Internet Protocol (IP). BILLABLE CONTACT HOURS: 4

### **CIS 1310 CCNA Studies II: Switching, Routing, and Wireless Essentials ..... 4 Credit Hours**

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

Switching, Routing, and Wireless Essentials (SRWE) covers the architecture, components, and operations of routers and switches in small networks and introduces wireless local area networks (WLAN) and security concepts. Students learn how to configure and troubleshoot routers and switches for advanced functionality using security best practices and resolving common issues with protocols in both IPv4 and IPv6 networks. BILLABLE CONTACT HOURS: 4

**CIS 1320 CCNA Studies III: Enterprise Networking , Security, and Automation .....4 Credit Hours**

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

Enterprise Networking, Security, and Automation (ENSA) describes the architecture, components, operations, and security to scale for large, complex networks, including wide area network (WAN) technologies. The course emphasizes network security concepts and introduces network virtualization and automation. Students learn how to configure, troubleshoot, and secure enterprise network devices and understand how application programming interfaces (API) and configuration management tools enable network automation. BILLABLE CONTACT HOURS: 4

**CIS 1330 CCNA Studies IV: Cybersecurity Operations .....4 Credit Hours**

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

CCNA Cybersecurity Operations provides an introduction to the knowledge and skills needed for a Security Analyst working with a Security Operations Center team. It teaches core security skills needed for monitoring, detecting, investigating, analyzing and responding to security events, thus protecting systems and organizations from cybersecurity risks, threats and vulnerabilities. BILLABLE CONTACT HOURS: 4

**CIS 1400 Web Design I .....4 Credit Hours**

**Equivalent:** CIS 1510 | CIS 1110

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

This course focuses on the fundamentals of web site content development. Students will be introduced to the fundamental HTML5 structure of a webpage and then proceed to creating pages using a professional web editing tool. Students will create a fully functional original website using the web design editing tool that has elements such as images, hyperlinks, cascading style sheets for formatting, tables and integration of certain multimedia elements such as sound files and videos. Discussions will include accessibility of the design, overall site maintenance and publishing using FTP technologies. Students taking this course should have working knowledge of Windows and basic knowledge of the Internet. BILLABLE CONTACT HOURS: 4

**CIS 1420 HTML5 Programming .....3 Credit Hours**

**Equivalent:** CIS 2781

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

This course focuses on designing and coding internet web pages using HTML5. The student will develop web pages by designing, entering, and testing code using this standard (with a simple text editor) rather than by using web development tools. Topics include - HTML5 element structure, web forms, multimedia, style sheets (CSS3) to apply formatting and layout characteristics in addition to applying special effects. This course will also include an introduction to the JavaScript programming language. Students should be familiar with the basics of both word processing and Windows file management techniques before enrolling in this course. BILLABLE CONTACT HOURS: 3

**CIS 1440 Front-End Web Technologies (HTML, CSS, and JavaScript) .....4 Credit Hours**

**Equivalent:** CIS 1125

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

**Note:** Prerequisites for courses in this department are not automatically waived for College Guest students and students with a bachelor's degree or higher from a U.S. institution.

This course is a comprehensive front-end Web design and development course designed to equip students with essential skills in building and styling interactive Web pages. It lays a strong foundation in the core technologies of the Web: HTML, CSS, and JavaScript. Students will gain an understanding of how the Internet and Web function, learning to create Web pages from scratch using HTML5 and how to enhance their visual appeal with CSS3. The course also covers the fundamentals of JavaScript, teaching students to dynamically manipulate Web content through understanding objects, functions, events, and the Document Object Model (DOM). With a focus on practical application, students will learn to use arrays and modern JavaScript techniques, such as the Fetch API for handling request/response systems. Critical thinking and problem-solving are emphasized throughout, preparing students to tackle Web development challenges effectively. BILLABLE CONTACT HOURS: 4

**CIS 1500 Introduction to Programming (Java) ...4 Credit Hours**

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

Students should have elementary Algebra skills and be familiar with both elementary word processing and file management techniques prior to enrolling in this class. Students will be introduced to the fundamental techniques and syntax for understanding, designing, constructing, debugging, and testing object-oriented programs by studying the Java programming language. The structured programming basics of process, selection and iteration will be covered as well as primitive and complex data typing, methods, parameters and input/output. The basics of graphical user interface (GUI) programming such as event handling, windows and widgets will be introduced. Fundamental object-oriented concepts of classes, methods, abstraction, encapsulation and inheritance will also be introduced. Students will be required to complete computer-based assignments inside/outside of class. BILLABLE CONTACT HOURS: 4

**CIS 1512 Principles of Software Engineering .....3 Credit Hours**

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

**Pre- or Corequisite:** CIS-1440 or consent of instructor.

This course is focused on formal methods and approaches used in the design, development, testing and maintenance of computer software. Each stage of the software development life cycle (SDLC) will be studied in detail. Topics such as low-level design, high-level design, modeling with UML (Unified Modeling Language), iterative development models, rapid application development (RAD), formal testing methods, incremental deployment, formal metrics, as well as appropriate use of associated tools will be covered with practical applications. Students will be required to complete computer-based assignments inside/outside of class. BILLABLE CONTACT HOURS: 3

**CIS 1550 Introduction to Secure Programming . 3 Credit Hours**

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

This course presents cybersecurity content related to analyzing software risks, understanding likely points of application attack, and making preliminary decisions about how software applications mitigate attack. The student will learn how to identify systemic threats in any deployment environment, understand the vulnerabilities of common software applications, and how to construct software that are responsive to identified vulnerabilities. BILLABLE CONTACT HOURS: 3

**CIS 1600 Fundamentals of Cybersecurity ..... 4 Credit Hours**

**Equivalent:** CIS 2839 | CIS 2839

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

**Note:** Prerequisites for courses in this department are not automatically waived for College Guest students and students with a bachelor's degree or higher from a U.S. institution.

This course is designed for aspiring security professionals, system or network administrators, or other information technology professionals who want to learn about computer security. Students will be well prepared for the Security+ Exam after taking this class. This course focuses on general security concepts, communication security, infrastructure security, basics of cryptography, and operational organizational security. Students will be required to complete computer-based assignments inside and outside of class. Students should have a basic understanding of computer networking prior to enrolling in this class. BILLABLE CONTACT HOURS: 4

**CIS 1610 Data Security ..... 4 Credit Hours**

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

**Prerequisite:** CIS 1600

**Note:** Prerequisites for courses in this department are not automatically waived for College Guest students and students with a bachelor's degree or higher from a U.S. institution.

This course is focused on the structure of data and database systems, their vulnerabilities to cyber attacks, and the proper techniques required to protect these systems from damage. Material covered will include: analysis of database-related malware; data system architecture; database system installation and configuration; data access controls and authentication; data security tools and devices; and security testing and auditing. Students will be required to complete computer-based assignments inside and outside of class. BILLABLE CONTACT HOURS: 4

**CIS 1620 Introduction to Cryptography ..... 4 Credit Hours**

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

**Prerequisite:** CIS 1600

**Note:** Prerequisites for courses in this department are not automatically waived for College Guest students and students with a bachelor's degree or higher from a U.S. institution.

This course is focused on basic techniques of encryption and decryption and their application to computer security. Topics covered will include: basic number theory and finite field arithmetic used in cryptography; symmetric ciphers; asymmetric ciphers; block and stream ciphers; implementation of popular encryption algorithms (e.g., AES); hash algorithms; digital signatures; and key management and distribution. Students will be required to complete computer-based assignments inside and outside of class. BILLABLE CONTACT HOURS: 4

**CIS 1630 Security Policy, Legal, Ethics and Compliance ..... 3 Credit Hours**

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

**Prerequisite:** CIS 1600

**Note:** Prerequisites for courses in this department are not automatically waived for College Guest students and students with a bachelor's degree or higher from a U.S. institution.

This course provides a comprehensive introduction to the identification, selection, assessment, and continuous monitoring of management controls that provide a cyber security governance structure throughout an organization and its supply chain. The course will emphasize security policies and frameworks, their organizational implications, to the psychology, ethics, and legal considerations of their implementation. BILLABLE CONTACT HOURS: 3

**CIS 1720 Multimedia Data Management ..... 4 Credit Hours**

**Equivalent:** CIS 1001

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

This course will give students a broad foundation in issues surrounding multimedia, including the role of and design of multimedia systems which incorporate digital audio, graphics and video, underlying concepts and representations of sound, pictures and video, data compression, transmission and storage, integration of media, multimedia authoring, and delivery of multimedia. Course will also include industry overview, societal issues, cultural implications, visual literacy and career opportunity. The students will be required to complete computer-based assignments inside/outside of class. BILLABLE CONTACT HOURS: 4

**CIS 1721 Web Design II ..... 3 Credit Hours**

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

**Prerequisite:** CIS 1400 or consent of instructor.

**Note:** Prerequisites for courses in this department are not automatically waived for College Guest students and students with a bachelor's degree or higher from a U.S. institution.

This course will provide students with intermediate to advanced skills in web publishing focusing on abilities to design web pages with variations in web browsers in mind. Students will continue to work with a web design editing tool and create pages that include forms, validation, and cascading style sheet based design layout. Students will create a website that is ADA (American Disabilities Act) compliant. Students should be familiar with elementary word processing and MS Windows file management techniques prior to enrolling in this class. Students will be required to complete computer-based assignments inside/outside of class. BILLABLE CONTACT HOURS: 3

**CIS 1722 Web Animation ..... 3 Credit Hours**

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

This course will provide introductory level knowledge of effectively working with vector based design applications aimed at the creation of animation, games, and interactive components for use on the internet. Students will focus on the creation of basic animation and navigation components for use on web sites as well as for projects aimed at offline use. Students taking this course should have basic Windows background and general knowledge of internet technologies. BILLABLE CONTACT HOURS: 3



**CIS 1801 Special Topics I: Network Remediation .....3 Credit Hours**

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

**Prerequisite:** The prerequisite for a special topics section will depend on the content of that section. Refer to the specific section using OCC's online system for a description of the current course and its associated prerequisites.

**Note:** Prerequisites for courses in this department are not automatically waived for College Guest students and students with a bachelor's degree or higher from a U.S. institution.

Network Remediation. BILLABLE CONTACT HOURS: 3

**CIS 1802 Special Topics I: Introduction to Cybersecurity and Risk Management ..... 3 Credit Hours**

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

**Prerequisite:** The prerequisite for a special topics section will depend on the content of that section. Refer to the specific section using OCC's online system for a description of the current course and its associated prerequisites.

**Note:** Prerequisites for courses in this department are not automatically waived for College Guest students and students with a bachelor's degree or higher from a U.S. institution.

Introduction to Cybersecurity and Risk Management. BILLABLE CONTACT HOURS: 3

**CIS 1803 Special Topics I ..... 1-4 Credit Hours**

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

**Prerequisite:** The prerequisite for a special topics section will depend on the content of that section. Refer to the specific section using OCC's online system for a description of the current course and its associated prerequisites.

**Note:** Prerequisites for courses in this department are not automatically waived for College Guest students and students with a bachelor's degree or higher from a U.S. institution.

Students will be introduced to a particular contemporary topic or issue in information science that is relevant in today's environment. Refer to the specific section using OCC's online system for current topics. Students will be required to complete computer-based assignments inside and outside of class. BILLABLE CONTACT HOURS: 1 - 4

**CIS 1804 Special Topics I: Macro Media Director ..... 4 Credit Hours**

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

**Prerequisite:** The prerequisite for a special topics section will depend on the content of that section. Refer to the specific section using OCC's online system for a description of the current course and its associated prerequisites.

**Note:** Prerequisites for courses in this department are not automatically waived for College Guest students and students with a bachelor's degree or higher from a U.S. institution.

Macro Media Director. BILLABLE CONTACT HOURS: 4

**CIS 2111 Systems Analysis and Design (UML) ..4 Credit Hours**  
**Equivalent:** CIS 2030 | DPR 2030

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

Students should be familiar with the basics of both word processing and Windows file management techniques before enrolling in this course. Students will survey and practice the techniques used by system analysts and programmers in the analysis and design of computer-based business information systems with focus on the Unified Modeling Language (UML). Both traditional and object-oriented methods will be presented. System and object-oriented development life cycles (SDLC and ODLC) and subjects in computer-aided software engineering (CASE) such as project management, requirements modeling, data flow and entity relationship diagrams (DFD and ERD) and data dictionaries are among the included topics. Students will be required to complete computer-based assignments inside/outside of class. BILLABLE CONTACT HOURS: 4

**CIS 2131 Python Programming ..... 4 Credit Hours**

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

The course will introduce the fundamental techniques and syntax for understanding, designing, constructing, debugging, and testing object-oriented programs using the Python programming language. The structured programming basics of process, selection and iteration will be covered as well as primitive and complex data typing, methods, parameters and input/output. Fundamental object-oriented concepts of classes, methods, abstraction, encapsulation and inheritance will also be introduced. Students will be required to complete computer-based assignments inside/outside of class. Students should have elementary algebra skills and be familiar with both elementary word processing and file management techniques prior to enrolling in this class. BILLABLE CONTACT HOURS: 4

**CIS 2141 R Programming for Data Science ..... 4 Credit Hours**

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

**Prerequisite:** MAT 1150 or placement into a higher level math course.

**Note:** Prerequisites for courses in this department are not automatically waived for College Guest students and students with a bachelor's degree or higher from a U.S. institution.

This course will teach students how to program in R for effective data analysis; how to install and configure software necessary for a statistical programming environment and describe generic programming language concepts as they are implemented in a high-level statistical language. The course covers practical issues in statistical computing which includes programming in R, reading data into R, accessing R packages, writing R functions, and debugging R code. Students will learn data structuring, transforming, visualizing, and modeling through hands on exercises. Students should be familiar with both elementary word processing and file management techniques prior to enrolling in this class. BILLABLE CONTACT HOURS: 4

**CIS 2151 JAVA Programming ..... 4 Credit Hours**

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

**Note:** Prerequisites for courses in this department are not automatically waived for College Guest students and students with a bachelor's degree or higher from a U.S. institution.

This course is designed to introduce the student to the essentials of Java, utilizing an Integrated Development Environment (IDE) for practical experience in coding, debugging, and running applications. The curriculum covers fundamental programming concepts including data types, variables, control statements, and file Input/Output (I/O), alongside an introduction to arrays and Object-Oriented Programming (OOP) principles like encapsulation, inheritance, and polymorphism. Students will also gain hands-on experience in developing Graphical User Interface (GUI) applications using a popular GUI framework. Emphasizing critical thinking, the course prepares students to tackle programming challenges effectively, laying a solid foundation for further learning and professional development in the field of software engineering. BILLABLE CONTACT HOURS: 4

**CIS 2232 Fundamentals of System Support ..... 4 Credit Hours**

**Equivalent:** DPR 2050

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

Students will be introduced to the basic software and hardware concepts and facilities needed for simple support tasks. Topics covered include system boot sequences, disk partitioning, disk fragmentation, system configuration files, types of memory and memory management, basic OS commands and batch file construction. Emphasis is given to the Windows OS relationships and facilities. Hardware factors related to system and software evaluation, selection, purchase and installation are presented. Students will be required to complete computer-based assignments inside/outside of class. BILLABLE CONTACT HOURS: 4

**CIS 2241 Discrete Structures ..... 4 Credit Hours**

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

**Prerequisite:** MAT 1150 or placement into a higher level math course. CIS 1500 or CIS 2131 or CIS 2151 or CIS 2252 or CIS 2656 or CIS 2757  
**Note:** Prerequisites for courses in this department are not automatically waived for College Guest students and students with a bachelor's degree or higher from a U.S. institution.

This course provides an introduction to discrete structures, covering topics such as mathematical logic, set theory, trees, matrices, and graphs, as they apply to computer science, data science, and software engineering. Programming applications of matrices as used in computer science will be covered. BILLABLE CONTACT HOURS: 4

**CIS 2252 C++ Programming ..... 4 Credit Hours**

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

Students should have a basic understanding of general programming concepts and techniques prior to enrolling in this class. Students will be instructed in the syntax and semantics of the ANSI C++ language. Topics covered include control structures, arrays, pointers, strings, dynamic memory management, class definition and object-based development, file I/O, overloading, exception handling, and template libraries. Students will be required to complete computer-based assignments inside/outside of class. BILLABLE CONTACT HOURS: 4

**CIS 2333 Web System Administration ..... 4 Credit Hours**

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

**Prerequisite:** CIS 1300

**Note:** Prerequisites for courses in this department are not automatically waived for College Guest students and students with a bachelor's degree or higher from a U.S. institution.

This course focuses on the operation and administration of Web application servers such as Apache HTTP, IIS, Tomcat and WebSphere. Students will study the basic structure and function of Web servers as well as the common tasks and services performed by administrators. Topics include Web protocols and related networking; Web server installation and configuration; integration with other essential services such as email, database management, file transfer, domain name services, and authentication; security; monitoring and performance; and virtualization. Students will be required to complete computer-based assignments inside and outside of class. BILLABLE CONTACT HOURS: 4

**CIS 2353 Data Structures ..... 4 Credit Hours**

**Equivalent:** DPR 2810

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

**Prerequisite:** CIS 1500 or CIS 2131 or CIS 2151 or CIS 2252 or CIS 2757

**Note:** Prerequisites for courses in this department are not automatically waived for College Guest students and students with a bachelor's degree or higher from a U.S. institution.

Students will investigate the programming techniques and theories involved in implementing linked lists, queues, stacks and tree structures. Recursion, searching techniques and sorting algorithms will also be considered. Students will be required to complete computer-based assignments inside and outside of class. BILLABLE CONTACT HOURS: 4

**CIS 2434 Introduction to Linux and Unix Administration ..... 3 Credit Hours**

**Equivalent:** CIS 2332

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

Students should be familiar with elementary word processing and basic computer concepts prior to enrolling in this course. This hands-on class covers the concepts related to Linux/Unix installation and system administration. Students will install and administer a Linux/Unix operating system using a virtual machine software product. It is intended for students who plan to work as Linux/Unix system administrators or for those who plan to take one or more certification tests as part of their professional preparation. Students will be required to complete computer-based assignments inside/outside of class. BILLABLE CONTACT HOURS: 3

**CIS 2454 Full Stack Web Development ..... 4 Credit Hours**

**Equivalent:** CIS 1930

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

**Prerequisite:** CIS 1440

**Note:** Prerequisites for courses in this department are not automatically waived for College Guest students and students with a bachelor's degree or higher from a U.S. institution.

This course focuses on design and implementation techniques for Web-based application software. Server-side software design and development techniques associated with Web Developer job skills will be emphasized. Topics to be covered will include: Web application architecture; design patterns and application frameworks; PHP language basics; Asynchronous JavaScript and XML (AJAX)-based request processing; and Web application security. Students will be required to complete computer-based assignments inside and outside of class. BILLABLE CONTACT HOURS: 4

**CIS 2515 Database Design and Management with Oracle SQL .....4 Credit Hours**

**Equivalent:** DPR 2830

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

**Prerequisite:** CIS 1200 or consent of instructor.

**Note:** Prerequisites for courses in this department are not automatically waived for College Guest students and students with a bachelor's degree or higher from a U.S. institution.

This course will focus on design and management of database environments using Oracle SQL and associated Oracle technologies. Topics include enterprise information resource planning and object-oriented and entity-relationship data modeling methodologies, normalization and the relational model, logical and physical database design, and implementation, population and processing of a relational database for data access, report generation, database definition, data manipulation, and access control. Oracle-specific materials used in this course are designed to prepare students for an Oracle Database SQL exam which is the first exam required to become an Oracle Certified Associate or Oracle Certified Professional. Students will be required to complete computer-based assignments inside and outside of class. BILLABLE CONTACT HOURS: 4

**CIS 2535 Microsoft Windows Server Administration .....3 Credit Hours**

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

Students should be familiar with the basics of both word processing and Microsoft Windows file management techniques and basic hardware, software, and network operating system, architecture, and protocol concepts needed for simple support tasks prior to enrolling in this course. Concepts of electronic business communications and local area networks will be covered. The Microsoft Windows Server operating system will be used and studied in this course. Installation of network operating system, setup of users and groups, files and folder trustee rights, and console management will be covered. Students will be required to complete computer-based assignments inside/outside of class. This course covers material in and prepares students for the first part of Microsoft's MCSA and MCSE certification tracks. BILLABLE CONTACT HOURS: 3

**CIS 2541 Introduction to Machine Learning ..... 4 Credit Hours**

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

**Prerequisite:** CIS 2131, MAT 1580

**Note:** Prerequisites for courses in this department are not automatically waived for College Guest students and students with a bachelor's degree or higher from a U.S. institution.

This course provides an introduction to fundamental machine learning topics in the context of data science. Students will learn fundamental examples and applications of machine learning, and types of machine learning systems, including supervised, unsupervised, semi-supervised, and reinforcement. Discussion of major challenges and solutions will be covered as well. BILLABLE CONTACT HOURS: 4

**CIS 2616 Database Application Design and Development with Oracle PL/SQL .....4 Credit Hours**

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

**Prerequisite:** CIS 1200 or consent of instructor.

**Note:** Prerequisites for courses in this department are not automatically waived for College Guest students and students with a bachelor's degree or higher from a U.S. institution.

This course will focus on design and development of database applications using Oracle PL/SQL, Oracle development tools, and use of Oracle XML data types for implementation of PL/SQL programs, procedures, functions, packages, and triggers. Oracle-specific materials used in this course are designed to prepare students for the Oracle Program with PL/SQL exam which is the second exam required to become an Oracle Certified Associate or Oracle Certified Professional. Students will be required to complete computer-based assignments inside and outside of class. BILLABLE CONTACT HOURS: 4

**CIS 2636 Network Administration ..... 4 Credit Hours**

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

**Prerequisite:** CIS 1300

**Note:** Prerequisites for courses in this department are not automatically waived for College Guest students and students with a bachelor's degree or higher from a U.S. institution.

This course is designed for Information Technology professionals who want to learn advanced topics in network administration. Areas covered include topics like routing protocols, congestion control algorithms, Quality of Service. The student will also be exposed to network security, trouble shooting networks, remote access technologies like VPN and some router switch configuration. Students will be required to complete computer-based assignments inside/outside of class. BILLABLE CONTACT HOURS: 4

**CIS 2637 Big Data and NoSQL Systems ..... 3 Credit Hours**

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

**Prerequisite:** CIS 1200

**Note:** Prerequisites for courses in this department are not automatically waived for College Guest students and students with a bachelor's degree or higher from a U.S. institution.

This course is focused on the architecture, design, implementation and support of Big Data systems and non-traditional information retrieval techniques (i.e. techniques that do not use structured query languages). Topics covered include: characteristics and analysis of big data; big data life cycle; big data platforms and highly distributed file systems; big data processing and storage technologies; and NoSQL. Students will be required to complete computer-based assignments inside and outside of class. BILLABLE CONTACT HOURS: 3

**CIS 2656 Visual Basic.NET Programming ..... 4 Credit Hours**

**Equivalent:** CIS 1250 | DPR 1250

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

This course focuses on software design and development techniques with the Visual Basic .NET programming language. Topics to be covered will include: Overview of the Microsoft .NET architecture; user interface forms and controls; variables, arrays, procedures, and control structures; object-oriented programming techniques; exception handling; data access with ADO.NET; and simple integration with Web technologies. Students will be required to complete computer-based assignments inside and outside of class. BILLABLE CONTACT HOURS: 4

**CIS 2737 Database Administration .....4 Credit Hours**

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

**Prerequisite:** CIS 1200

**Note:** Prerequisites for courses in this department are not automatically waived for College Guest students and students with a bachelor's degree or higher from a U.S. institution.

The purpose of the Database Administration course is to train students on typical activities performed by a database administrator (DBA) and on issues important to efficient performance of a database. The course will involve significant hands-on and lab work using the Oracle and/or MySQL server DBMS. Students will be required to complete computer-based assignments inside/outside of class. BILLABLE CONTACT HOURS: 4

**CIS 2757 C# Programming .....4 Credit Hours**

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

Students should have a basic understanding of general programming concepts and techniques prior to enrolling in this class. This course focuses on the design and implementation of software using the C# programming language. Students will learn how to develop programs that utilize classes and objects, arrays, graphical user interfaces, event-driven programming and exception handling. Visual Studio .NET will be used as the primary integrated development environment. Students will be required to complete computer-based assignments inside and outside of class. BILLABLE CONTACT HOURS: 4

**CIS 2777 Introduction to Applied AI .....4 Credit Hours**

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

**Prerequisite:** CIS 2131

**Note:** Prerequisites for courses in this department are not automatically waived for College Guest students and students with a bachelor's degree or higher from a U.S. institution.

This course explores the foundational principles of artificial intelligence (AI), focusing on practical applications in various industries. Students will engage with Large Language Models (LLMs) for tasks like text generation and summarization, delve into prompt engineering techniques, and understand the creative potential of Generative AI technologies such as GANs and VAEs. Through hands-on projects, this course emphasizes critical thinking and real-world problem-solving, preparing students to effectively apply AI concepts and tools in diverse settings. BILLABLE CONTACT HOURS: 4

**CIS 2818 Mobile Application Development (Android) .....4 Credit Hours**

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

**Prerequisite:** CIS 1500 or CIS 2131 or CIS 2151 or CIS 2252 or CIS 2757

**Note:** Prerequisites for courses in this department are not automatically waived for College Guest students and students with a bachelor's degree or higher from a U.S. institution.

This course focuses on the design and implementation of wireless handheld application software on the Android platform for business and personal use. Students will use the Android Studio integrated development environment (IDE) to develop and test application software. Development techniques will focus on operational aspects of mobile devices that distinguish them from PCs and general computing platforms. Students will be required to complete computer-based assignments inside and outside of class. BILLABLE CONTACT HOURS: 4

**CIS 2838 System Security .....4 Credit Hours**

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

**Prerequisite:** CIS 1600

**Note:** Prerequisites for courses in this department are not automatically waived for College Guest students and students with a bachelor's degree or higher from a U.S. institution.

This course is designed for aspiring security professionals, system or network administrators, or other information technology professionals who want to learn about computer security. Being a part of two courses, this part focuses on the security engineer who needs to worry about the attacks used by hackers and the defenses against them. The course makes an effort to understand defenses against Reconnaissance, Scanning, Gaining Access, Maintaining access and covering tracks. Last but not the least, the course covers computer ethics. The Students will be required to complete computer-based assignments inside/outside of class. BILLABLE CONTACT HOURS: 4

**CIS 2845 Computer Forensics .....4 Credit Hours**

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

**Prerequisite:** CIS 1600

**Note:** Prerequisites for courses in this department are not automatically waived for College Guest students and students with a bachelor's degree or higher from a U.S. institution.

With ever growing reliance on computers for every day life projects, and increased focus on security and breach of security and privacy, there is a need for a course which can help security professionals and law enforcement agencies learn ways to investigate security breaches. This course is designed to introduce a variety of operating systems investigation techniques, incident response tactics, and legal issues. The course helps learn forensic techniques and tools for both Windows and Linux investigations. Students will be required to complete computer-based assignments inside and outside of class. BILLABLE CONTACT HOURS: 4

**CIS 2850 Introduction to Graphics Modeling Software .....4 Credit Hours**

**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

**Note:** Prerequisites for courses in this department are not automatically waived for College Guest students and students with a bachelor's degree or higher from a U.S. institution.

This course equips students with the foundational skills necessary for 3D design and animation for games. The course will also provide information about Blender user interface, creating and manipulating basic shapes, and fundamental 3D modeling terminology and techniques. The course further delves into applying materials and textures to 3D models, utilizing lights, shadows, and cameras to enhance visual storytelling, and exploring the basics of sculpting tools for detailed model creation. Animation principles, including keyframing and the use of dope sheets, are also covered to bring models to life. The course encourages critical thinking throughout, promoting learning and preparing students for both practical application for games, and more in-depth exploration of the topics within the course. BILLABLE CONTACT HOURS: 4



**CIS 2858 Cloud Native Systems and Integration .....4 Credit Hours****Equivalent:** CIS 2414**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.**Prerequisite:** CIS 2454**Note:** Prerequisites for courses in this department are not automatically waived for College Guest students and students with a bachelor's degree or higher from a U.S. institution.

This course focuses on design and implementation strategies for Cloud-native architecture and technologies which are an approach to designing, constructing, and operating workloads that are built in the cloud and take full advantage of the cloud computing model. Topics to be covered will include: Web middleware-related technologies; multi-tier application frameworks; Representational State Transfer (RESTful) Web services; and Cloud Computing services. Students will use a popular Integrated Development Environment (IDE) tool to create and integrate Web application components. Completion of computer-based assignments inside and outside of class will be required. BILLABLE CONTACT HOURS: 4

**CIS 2859 Foundations of Game Software Development .....4 Credit Hours****ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

Students should have a basic understanding of object-oriented programming prior to enrolling in this class. This course focuses on the fundamentals and techniques of game software development. Students will use a popular game engine and associated software tools to learn how various elements of games are created, integrated into a system, and used in game play. Game system elements include: game engine functions; scripts; graphical interface; models; terrains and worlds; textures; sound; and support infrastructure. Students will also apply mathematical foundations used in computer graphics. Students will be required to complete computer-based assignments inside and outside of class. BILLABLE CONTACT HOURS: 4

**CIS 2862 Game Design .....3 Credit Hours****ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.

This course is focused on the essential principles of designing game software. The philosophy of video games as a form of entertainment as well as important design concepts that feature player-centric approaches will be explored. Other topics to be covered include: the genres of games; design components and processes; game analysis frameworks; storyboarding; creative and expressive play; character development; storytelling and narrative; game play mechanics; defining appropriate physical models and game worlds; and level design. Students will be required to complete computer-based assignments inside and outside of class. BILLABLE CONTACT HOURS: 3

**CIS 2878 DevOps Engineering .....3 Credit Hours****ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.**Prerequisite:** CIS 1512**Note:** Prerequisites for courses in this department are not automatically waived for College Guest students and students with a bachelor's degree or higher from a U.S. institution.

This course delves into the principles and practices of DevOps, emphasizing its crucial role in modern software development and deployment lifecycles. Through a comprehensive exploration of tools, methodologies, and collaborative frameworks, students gain proficiency in integrating development and operations teams effectively. Key topics include declarative deployment, version control, implementation of CI/CD pipelines, and Infrastructure as Code (IaC) principles. Students engage in practical exercises to reinforce their understanding of DevOps concepts and their application in real-world scenarios. BILLABLE CONTACT HOURS: 3

**CIS 2980 Computer Service Technologies & Techniques A + .....4 Credit Hours****Equivalent:** ECT 2150**ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.**Note:** Prerequisites for courses in this department are not automatically waived for College Guest students and students with a bachelor's degree or higher from a U.S. institution.

This course provides the necessary preparation to take the industry standard Core Hardware Certification exams. Topics studies include, but are not limited to: core hardware requirements, installation, configuration and upgrading, diagnosing and troubleshooting, preventive maintenance, motherboard/processors/memory, basic networking and security. Students will be required to complete computer-based assignments outside of class. Note: certification exams are administered and charged separately by an outside agency. BILLABLE CONTACT HOURS: 4

**CIS 2991 Software Engineering Capstone .....3 Credit Hours****ESL Placement Level:** For English-as-a-Second-Language (ESL) students, placement in ESL 2520.**Prerequisite:** CIS 1512 and (CIS 2454 or CIS 2818)**Note:** Prerequisites for courses in this department are not automatically waived for College Guest students and students with a bachelor's degree or higher from a U.S. institution.

This course is focused on development of material for a personal 'software' portfolio that may be used to support employment opportunity applications. Common tools and techniques used in work environments as well as typical workplace processes will be explored with the purpose of preparing students for employment as software developers. Students will be required to complete computer-based assignments inside and outside of class. BILLABLE CONTACT HOURS: 3