CRC computer information science programs include study in computer programming, information systems security, computer networking, management information systems, and computer applications. A wide range of degree and certificate programs are available to meet the needs of transfer students who plan to complete a four-year degree as well as career/technical students who plan to enter the workforce.


CIS DEPARTMENT PAGE (/ACADEMICS/COMPUTER-INFORMATION-SCIENCE-(CIS))

LaTonya Williams (/about-us/contact-us/faculty-and-staff-directory/latonya-williams)

Wendell Fishman (/about-us/contact-us/faculty-and-staff-directory/wendell-fishman)

Social and Behavioral Sciences

(916) 691-7359

WilliaL3@crc.losrios.edu (mailto:WilliaL3@crc.losrios.edu)
Associate Degrees

A.S. in CIS - Computer Science

This program provides a foundation in algorithm development, programming techniques, data structures, and structured problem solving.

This A.S. Degree would be appropriate for a student planning to transfer to the California State University (CSU) or the University of California (UC) to major in either Computer Science or Computer Engineering.

It is critical that transfer students regularly meet with a CRC counselor and the CRC programming faculty to select specific CRC courses that match university degree requirements.

**Catalog Date:** June 1, 2019

<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1st Semester:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CISP 300</td>
<td>Algorithm Design/Problem Solving</td>
<td>3</td>
</tr>
<tr>
<td><strong>2nd Semester:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CISP 360</td>
<td>Introduction to Structured Programming</td>
<td>4</td>
</tr>
<tr>
<td><strong>3rd Semester:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CISP 400</td>
<td>Object Oriented Programming with C++</td>
<td>4</td>
</tr>
<tr>
<td><strong>Spring Semester only:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CISP 310</td>
<td>Assembly Language Programming for Microcomputers</td>
<td>4</td>
</tr>
<tr>
<td><strong>4th Semester:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CISP 430</td>
<td>Data Structures</td>
<td>4</td>
</tr>
<tr>
<td><strong>Fall Semester in odd-numbered years only:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CISP 440</td>
<td>Discrete Structures for Computer Science</td>
<td>3</td>
</tr>
<tr>
<td>Total Units:</td>
<td></td>
<td>22</td>
</tr>
</tbody>
</table>

The corequisite for this course can be applied to the CRC graduation requirements.

*The CIS - Computer Science Associate in Science (A.S.) degree may be obtained by completion of the required program, plus general education requirements, plus sufficient electives to meet a 60-unit total. See CRC graduation requirements.*

---

**Student Learning Outcomes**

Upon completion of this program, the student will be able to:
• Redefine a complex problem into a sequential set of parts that can be translated into the language of programming logic.
• Design, write, test, and debug computer programs in a structured language, a low-level language, and an object-oriented language.
• Incorporate foundational data management concepts such as data structures within computer programs.

A.S. in CIS - Information Systems Security

This degree is designed to give students currently employed as an Information Technology (IT) Professional the additional skill sets necessary to work in this rapidly growing field.

HIGHLIGHTS:

• Hands-on experience in a state-of-the-art computer center
• Opportunities to work on specialized projects relating to computer information science, business and computer programming.
• Study in a field that has great employment opportunities and encompasses many careers.

NOTE TO TRANSFER STUDENTS: If you are interested in transferring to a four-year college or university to pursue a Bachelor's degree in this major, it is critical that you meet with a CRC counselor to select and plan the courses for your major. The courses that CRC requires for an Associate's degree in this major may be different from the requirements needed for the Bachelor's degree.

Catalog Date: June 1, 2019

Degree Requirements

<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CISC 310</td>
<td>Introduction to Computer Information Science</td>
<td>3</td>
</tr>
<tr>
<td>CISC 498</td>
<td>Work Experience in Computer Information Science - Core</td>
<td>1-4</td>
</tr>
<tr>
<td>CISN 300</td>
<td>Network Systems Administration</td>
<td>3</td>
</tr>
<tr>
<td>CISN 304</td>
<td>Networking Technologies</td>
<td>3</td>
</tr>
<tr>
<td>CISS 310</td>
<td>Network Security Fundamentals</td>
<td>3</td>
</tr>
<tr>
<td>CISS 320</td>
<td>Implementing Network Security and Counter Measures</td>
<td>3</td>
</tr>
<tr>
<td>CISS 330</td>
<td>Implementing Internet Security and Firewalls</td>
<td>3</td>
</tr>
<tr>
<td>CISS 341</td>
<td>Implementing Windows Operating System Security (3)</td>
<td>3</td>
</tr>
<tr>
<td>or CISS 342</td>
<td>Implementing Linux Operating System Security (3)</td>
<td>3</td>
</tr>
<tr>
<td>CISS 350</td>
<td>Disaster Recovery</td>
<td>3</td>
</tr>
<tr>
<td>CISS 356</td>
<td>Introduction to Information Assurance</td>
<td>3</td>
</tr>
</tbody>
</table>
The CIS - Information Systems Security Associate in Science (A.S.) degree may be obtained by completion of the required program, plus general education requirements, plus sufficient electives to meet a 60-unit total. See CRC graduation requirements.

### Student Learning Outcomes

Upon completion of this program, the student will be able to:

- **SLO #01:** Evaluate the different types of access control methods used to secure a network, in particular authentication, authorization and audit.
- **SLO #02:** Construct a Business Continuity and a Disaster Recovery Plan. These plans are used by an organization to resume partially or completely interrupted critical function(s) within a predetermined time after a disaster or temporary disruption.
- **SLO #03:** Analyze the different types of cryptography used in computer and network security in such areas as access control and information confidentiality.
- **SLO #04:** Recognize some of the methods used to properly conduct a computer forensics investigation. This discussion should begin with a discussion on ethics.
- **SLO #05:** Evaluate a firewall to prevent unauthorized access to a network or computer. Students will also learn how to allow access to key services while maintaining an organization's security.
- **SLO #06:** Evaluate, implement and manage secure remote-access technologies, such as Internet Detection Systems (IDS), which are powerful tools used for identifying and responding to network- and host-based intrusions.
- **SLO #07:** Distinguish the different ways to secure an operating system. Students will know how to maintain the integrity, authenticity, availability, and privacy of data.
- **SLO #08:** Analyze risks to a network and be able to implement a workable security policy that protects information assets from potential intrusion, damage or theft.

### Career Information

Computer Operator; Information Systems Security Specialist; Computer Systems Specialist; Computer Technician
This degree allows students to acquire basic core Information Technology competencies that will prepare them for a career in Computer Networking, Cybersecurity, and related fields.

**Catalog Date:** June 1, 2019

### Degree Requirements

<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CISC 310</td>
<td>Introduction to Computer Information Science</td>
<td>3</td>
</tr>
<tr>
<td>CISC 360</td>
<td>Information &amp; Communication Technology Essentials (A+)</td>
<td>4</td>
</tr>
<tr>
<td>CISN 304</td>
<td>Networking Technologies (3)</td>
<td>3</td>
</tr>
<tr>
<td>CISP 370</td>
<td>Beginning Visual Basic (4)</td>
<td>4</td>
</tr>
<tr>
<td>or CISP 360</td>
<td>Introduction to Structured Programming (4)</td>
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</table>

A minimum of 6 units from the following:

<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CISN 300</td>
<td>Network Systems Administration (3)</td>
<td></td>
</tr>
<tr>
<td>CISP 351</td>
<td>Introduction to Relational Database Design and SQL (3)</td>
<td></td>
</tr>
<tr>
<td>CISS 310</td>
<td>Network Security Fundamentals (3)</td>
<td></td>
</tr>
<tr>
<td>CISS 356</td>
<td>Introduction to Information Assurance (3)</td>
<td></td>
</tr>
<tr>
<td>CISS 360</td>
<td>Computer Forensics and Investigation (3)</td>
<td></td>
</tr>
<tr>
<td>BUS 310</td>
<td>Business Communications (3)</td>
<td></td>
</tr>
</tbody>
</table>

A minimum of 4 units from the following:

<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT 300</td>
<td>Introduction to Probability and Statistics (4)</td>
<td></td>
</tr>
<tr>
<td>MATH 341</td>
<td>Calculus for Business and Economics (4)</td>
<td></td>
</tr>
<tr>
<td>MATH 343</td>
<td>Modern Business Mathematics (4)</td>
<td></td>
</tr>
<tr>
<td>MATH 400</td>
<td>Calculus I (5)</td>
<td></td>
</tr>
</tbody>
</table>

**Total Units:** 24

The CIS - Information Technology Associate in Science (A.S.) degree may be obtained by completion of the required program, plus general education requirements, plus sufficient electives to meet a 60-unit total. See CRC graduation requirements.

### Student Learning Outcomes

Upon completion of this program, the student will be able to:

- Apply fundamental knowledge of computing and the current use of technology techniques, skills, and tools necessary for the computing practice.
- Evaluate and solve business problems with technology solutions using qualitative and quantitative information.
Assess user needs in the selection, creation, evaluation and administration of computer-based information systems.

Demonstrate appreciation of the Information Technology career field and the need to be lifelong learners.

Career Information

The Associate's degree in Information Technology prepares students to either enter the workforce as an entry-level computer or network support technician or pursue a bachelor's degree in managing information systems. Several CSUs currently offer baccalaureate IT or CT programs, as do several private universities. More CSUs are already working on build upper division programs based on the recently approved IT Model Curriculum.

A.S. in CIS - Server Administrator

CRC computer information science programs include study in computer programming, information systems security, computer networking, management information systems, and computer applications. A wide range of degree and certificate programs are available to meet the needs of transfer students who plan to complete a four-year degree as well as career/technical students who plan to enter the work force. Several of the programs are designed to promote a career ladder from certificate to associate degree to university transfer. Other programs are designed to upgrade the skill set of working IT professionals. All program options are designed with advice from business and industry representatives and conform to industry standards. For more information, refer to specific information about each program in the pages that follow. Transfer students should see a counselor to develop an educational plan based upon the specific requirements of the transfer institution.

This degree is designed for networking professionals who want to manage the components of a network system, based on the Microsoft Windows platform and Microsoft server software, on an ongoing basis; monitor and optimize the components of a network system; and diagnose and resolve problems regarding the components of a network system.

HIGHLIGHTS:

- Hands-on experience in a state-of-the-art computer lab.
- Opportunities to work on specialized projects relating to computer information science, business and computer programming.
- Study in a field that has great employment opportunities and encompasses many careers.

GUIDELINES TO STUDENTS:

- Microsoft Certified Solutions Associate (MCSA) certification requires three Microsoft exams (70-410, 70-411 and 70-412), which are covered in this degree.
- It is recommended that students use their best judgment and talk to a counselor or a CIS instructor to help guide them with their selection of the appropriate courses for their personal and/or professional needs.
NOTES TO TRANSFER STUDENTS:

- If you are interested in transferring to a four-year college or university to pursue a bachelor’s degree in this or a related major, it is critical you meet with a CRC counselor to select the appropriate transfer courses for your particular major.

- Schools vary widely in terms of their graduation requirements.

Catalog Date: June 1, 2019

### Degree Requirements

<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CISC 310</td>
<td>Introduction to Computer Information Science</td>
<td>3</td>
</tr>
<tr>
<td>CISC 360</td>
<td>Information &amp; Communication Technology Essentials (A+)</td>
<td>4</td>
</tr>
<tr>
<td>CISC 498</td>
<td>Work Experience in Computer Information Science - Core</td>
<td>1-4</td>
</tr>
<tr>
<td>CISN 300</td>
<td>Network Systems Administration</td>
<td>3</td>
</tr>
<tr>
<td>CISN 302</td>
<td>Intermediate Network Systems Administration</td>
<td>3</td>
</tr>
<tr>
<td>CISN 304</td>
<td>Networking Technologies</td>
<td>3</td>
</tr>
<tr>
<td>CISN 306</td>
<td>Advanced Network Systems Administration</td>
<td>3</td>
</tr>
<tr>
<td>CISP 370</td>
<td>Beginning Visual Basic</td>
<td>4</td>
</tr>
<tr>
<td>CISS 310</td>
<td>Network Security Fundamentals</td>
<td>3</td>
</tr>
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</table>

A minimum of 9 units from the following: 9^1

<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>CISN 301</td>
<td>Network Client Systems Administration (3)</td>
</tr>
<tr>
<td>CISN 303</td>
<td>Network Administration - Linux Server (3)</td>
</tr>
<tr>
<td>CISN 374</td>
<td>Messaging Server Administration (3)</td>
</tr>
<tr>
<td>CISN 378</td>
<td>Database Administration for Microsoft SQL Server (3)</td>
</tr>
<tr>
<td>CISS 342</td>
<td>Implementing Linux Operating System Security (3)</td>
</tr>
<tr>
<td>or CISS 341</td>
<td>Implementing Windows Operating System Security (3)</td>
</tr>
<tr>
<td>CISS 350</td>
<td>Disaster Recovery (3)</td>
</tr>
<tr>
<td>CISS 360</td>
<td>Computer Forensics and Investigation (3)</td>
</tr>
</tbody>
</table>

Total Units: 36 - 39

^1Students interested in Windows should take CISN 301, CISN 374, CISN 378 and CISS 341. Students interested in Linux should take CISN 303 and CISS 342. Students interested in security should take CISS 341 or 342, CISS 350 and CISS 360.

The CIS - Server Administrator Associate in Science (A.S.) degree may be obtained by completion of the required program, plus general education requirements, plus sufficient electives to meet a 60-unit total. See CRC graduation requirements.

---

Student Learning Outcomes
Upon completion of this program, the student will be able to:

- PSLO #01: Manage, implement, and maintain the typically complex computing environment of medium-to-large-sized companies
- PSLO #02: Manage and maintain a Windows server environment
- PSLO #03: Manage, implement, and maintain a Windows server network infrastructure
- PSLO #04: Develop the critical verbal, written, and quantitative skills needed to analyze complex issues
- PSLO #05: Develop an understanding of the basic concepts and major modes of inquiry used in a variety of disciplines
- PSLO #06: Develop a depth of understanding, including critical cognitive, psychomotor and affective skills, in this discipline
- PSLO #07: Make progress toward becoming engaged and self-reliant learners demonstrating habits of intellectual inquiry and striving toward their maximum potential
- PSLO #08: Become more prepared to contribute to a diverse democratic society with a pluralistic perspective

### Career Information


### A.S. in Management Information Systems

CRC's programs in CIS include study in computer programming, information systems security, computer networking, management information systems, and computer applications. A wide range of degree and certificate programs is available to meet the needs of transfer students who plan to complete a four-year degree as well as career/technical students who plan to enter the workforce. Several of the programs are designed to promote a career ladder from certificate to associate degree to university transfer. Other programs are designed to upgrade the skill set of working IT professionals. All program options are designed with advice from business and industry representatives and conform to industry standards. For more information, refer to specific information about each program in the pages that follow. Transfer students should see a counselor to develop an educational plan based upon the specific requirements of the transfer institution.

This program provides the basic skills necessary for a career in business, while allowing the student to select courses that fit individual needs and desires. This degree also meets some of CSU Sacramento's lower-division coursework for a BS in Business Administration with a Management Information Systems concentration.

### Highlights:

- Server Administrator
- Systems Administrator
- Network Administrator
- Information Systems Administrator
- Network Operations Analyst
- Network Technician
- Technical Support Specialist
Hands-on experience in a state-of-the-art computer center

Opportunities to work on specialized projects relating to computer information science, business and computer programming

Study in a field that has great employment opportunities and encompasses many careers

**Note to Transfer Students:**

If you are interested in transferring to a four-year college or university to pursue a bachelor's degree in this major, it is critical that you meet with a CRC counselor to select and plan the courses for your major. Schools vary widely in terms of the required preparation. The courses that CRC requires for an Associate's degree in this major may be different from the requirements needed for the Bachelor's degree.

**Catalog Date:** June 1, 2019

### Degree Requirements

<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Business:</strong></td>
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<tr>
<td>BUS 300</td>
<td>Introduction to Business</td>
<td>3</td>
</tr>
<tr>
<td>BUS 340</td>
<td>Business Law</td>
<td>3</td>
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<tr>
<td><strong>Accounting:</strong></td>
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<tr>
<td>ACCT 301</td>
<td>Financial Accounting</td>
<td>4</td>
</tr>
<tr>
<td>ACCT 311</td>
<td>Managerial Accounting</td>
<td>4</td>
</tr>
<tr>
<td><strong>Economics:</strong></td>
<td></td>
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<tr>
<td>ECON 302</td>
<td>Principles of Macroeconomics</td>
<td>3</td>
</tr>
<tr>
<td>ECON 304</td>
<td>Principles of Microeconomics</td>
<td>3</td>
</tr>
<tr>
<td><strong>Mathematics:</strong></td>
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<tr>
<td>MATH 341</td>
<td>Calculus for Business and Economics (4)</td>
<td>4 - 5</td>
</tr>
<tr>
<td>or MATH 343</td>
<td>Modern Business Mathematics (4)</td>
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</tr>
<tr>
<td>or MATH 355</td>
<td>Calculus for Biology and Medicine I (4)</td>
<td></td>
</tr>
<tr>
<td>or MATH 400</td>
<td>Calculus I (5)</td>
<td></td>
</tr>
<tr>
<td>STAT 300</td>
<td>Introduction to Probability and Statistics</td>
<td>4</td>
</tr>
<tr>
<td>CISA 318</td>
<td>Exploring Spreadsheet Software (1)</td>
<td>1 - 2</td>
</tr>
<tr>
<td>or CISA 315</td>
<td>Introduction to Electronic Spreadsheets (2)</td>
<td></td>
</tr>
<tr>
<td>CISA 308</td>
<td>Exploring Word Processing and Presentation Software (1)</td>
<td>1 - 4</td>
</tr>
<tr>
<td>or [ CISA 305</td>
<td>Beginning Word Processing (2)</td>
<td></td>
</tr>
<tr>
<td>and CISA 340</td>
<td>Presentation Graphics (2)</td>
<td></td>
</tr>
<tr>
<td><strong>Computer Information Science:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CISC 310</td>
<td>Introduction to Computer Information Science</td>
<td>3</td>
</tr>
<tr>
<td><strong>Lower Division Requirement for MIS Concentration:</strong></td>
<td></td>
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</tr>
<tr>
<td>CISP 370</td>
<td>Beginning Visual Basic</td>
<td>4</td>
</tr>
</tbody>
</table>
MATH 341 is recommended, but the other courses listed in this group will also meet the second MATH course requirement for Business Administration majors (all Concentrations, including Management Information Systems) transferring to CSU Sacramento.

The Management Information Systems Associate in Science (A.S.) degree may be obtained by completion of the required program, plus general education requirements, plus sufficient electives to meet a 60-unit total. See CRC graduation requirements.

### Student Learning Outcomes

Upon completion of this program, the student will be able to:

- Apply information and communication technology concepts to business problems (SLO #01).
- Demonstrate in-depth knowledge of common office computerized application software and operating systems (SLO #02).
- Create business documents such as letters, spreadsheets, presentations, publications and reports using appropriate business writing style, document appearance, grammar usage, and writing mechanics (SLO #03).
- Analyze the fundamentals of an operating system. Examine the relationship of the operating system to other applications programs (SLO #04).
- Analyze the effects of malware on an application and an operating system (SLO #05).
- Apply accounting concepts and principles in making decisions about business operations (SLO #06).
- Apply accounting concepts for costs used in manufacturing and service operations and analyze the behavior of the cost types (SLO #07).
- Apply economic concepts and principles in making decisions about business operations (SLO #08).
- Apply basic legal concepts and principles in various business environments (SLO #09).
- Propose solutions to basic business problems while applying critical thinking methods (SLO #10).
- Apply mathematics in a financial situation (SLO #11).
- Apply statistical methods to make predictions, and draw conclusions to make a hypothesis (SLO #12).

### Career Information

Systems Analyst; Applications Software Specialist; Entry-level Programmer; Small Business Manager
A.S. in Web Developer

Web Developers are proficient at creating Web site structure and interactivity. The Web Developer degree requires students to design, code, and modify websites from layout to function, in accordance to a client’s specification. Students will work with a variety of tools, environments, and applications to learn and practice website programming, scripting languages, and interacting with databases.

Catalog Date: June 1, 2019

Degree Requirements

<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CISW 300</td>
<td>Web Publishing</td>
<td>3</td>
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<tr>
<td>CISW 304</td>
<td>Cascading Style Sheets</td>
<td>2</td>
</tr>
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<td>CISC 323</td>
<td>Linux Operating System</td>
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</tr>
<tr>
<td>CISP 353</td>
<td>Application Development in a Client Server Environment</td>
<td>3</td>
</tr>
<tr>
<td>CISW 321</td>
<td>Web Site Development using Dreamweaver</td>
<td>3</td>
</tr>
<tr>
<td>CISW 350</td>
<td>Imaging for the Web</td>
<td>1</td>
</tr>
<tr>
<td>CISW 400</td>
<td>Client-side Web Scripting</td>
<td>4</td>
</tr>
<tr>
<td>CISW 410</td>
<td>Middleware Web Scripting</td>
<td>4</td>
</tr>
<tr>
<td>CISW 440</td>
<td>XML: Introduction to Extensible Markup Language</td>
<td>2</td>
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<td></td>
<td>A minimum of 5 units from the following:</td>
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<tr>
<td>CISC 324</td>
<td>Intermediate Linux Operating System (1)</td>
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<tr>
<td>CISW 308</td>
<td>Mobile Web Development (2)</td>
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</tr>
<tr>
<td>CISW 310</td>
<td>Advanced Web Publishing (4)</td>
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</tr>
<tr>
<td>CISW 355</td>
<td>Web Imaging Projects (2)</td>
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<td>CISW 402</td>
<td>Intermediate JavaScript (2)</td>
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</tr>
<tr>
<td>CISP 350</td>
<td>Database Programming (3)</td>
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</tr>
<tr>
<td></td>
<td>Total Units:</td>
<td>28</td>
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</tbody>
</table>

The Web Developer Associate in Science (A.S.) degree may be obtained by completion of the required program, plus general education requirements, plus sufficient electives to meet a 60-unit total. See CRC graduation requirements.

Student Learning Outcomes

Upon completion of this program, the student will be able to:

- Manage a multi-level Web site hosted on a Web server.
- Utilize multiple programs simultaneously in order to develop Web sites.
• Recommend Web scripting language, current markup language or Web authoring software, and cascading style sheets to develop complex Web sites that are uploaded via File Transfer Protocol (FTP) to a Web server.

• Research and implement current, valid World Wide Web Consortium (W3C) standards including technical recommendations for markup languages, and other recommendations as they are introduced.

• Plan a structured approach to Web site development that identifies the information dissemination needs of a client and organizes the content effectively and efficiently in order to communicate to an identified audience; then develop and implement an appropriate Web solution.

• Utilize client-side scripting in order to manipulate interactive objects like navigation bars, forms, rollovers, other event handling, and the control of windows, frames, and/or layers.

• Develop Web solutions that include form validation and processing, server-side programming, and database-driven Web development.

• Demonstrate proficiency in the process of Web project management on a real-world Web site including design specification, research, production, modification, time estimation, and presentation.

• Write code in a currently used Web scripting language.

Career Information


Certificates of Achievement

Business Information Worker Certificate

The Business Information Worker Certificate is designed to prepare students for entry-level office and administrative support in a variety of organizations.

Catalog Date: June 1, 2019

Certificate Requirements

<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUSTEC 302</td>
<td>Computer-Keyboarding</td>
<td>2</td>
</tr>
<tr>
<td>BUSTEC 110</td>
<td>Business Procedures for Professional Success</td>
<td>3</td>
</tr>
<tr>
<td>BUSTEC 120</td>
<td>Skills for Today's Office</td>
<td>1</td>
</tr>
<tr>
<td>CISC 308</td>
<td>Exploring Computer Environments and the Internet</td>
<td>1</td>
</tr>
<tr>
<td>CISA 305</td>
<td>Beginning Word Processing</td>
<td>2</td>
</tr>
<tr>
<td>COURSE CODE</td>
<td>COURSE TITLE</td>
<td>UNITS</td>
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<tr>
<td>-------------</td>
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</tr>
<tr>
<td>CISA 315</td>
<td>Introduction to Electronic Spreadsheets</td>
<td>2</td>
</tr>
<tr>
<td>BUS 100</td>
<td>English for the Professional</td>
<td>3</td>
</tr>
<tr>
<td>CISC 310</td>
<td>Introduction to Computer Information Science</td>
<td>3</td>
</tr>
<tr>
<td>Total Units</td>
<td></td>
<td>17</td>
</tr>
</tbody>
</table>

Enrollment Eligibility

To be eligible for enrollment in the program, the student must meet the following criteria:

- (None)

Enrollment Process

Eligible students are selected for the program according to the following steps:

- (None)

Student Learning Outcomes

Upon completion of this program, the student will be able to:

- **PSLO #1. DEMONSTRATE COMMON OFFICE APPLICATIONS SKILLS.**
- Diagram and differentiate basic computer terminology and apply it to communication.
- Construct and modify solutions to simple personal, educational or business needs applying use of office workplace computer programs.
- Design, diagram, and construct simple file folder structure on local storage, and access files for upload/download to/from online tools.
- Formulate expressions and construct logic comparisons using proper symbols and syntax in workplace computer programs.
- Create and organize various types of files using various workplace computer programs.
- Construct projects efficiently generating solutions using various workplace computer programs and shortcuts.
- Demonstrate the mechanics and use of word processing software to organize and present data in a multicolumn, multipage newsletter format including banner, bordering, tables, text effects and embedded graphics.
• Demonstrate appropriate pagination and word processing features to apply a formal (MLA/APA/Chicago) style of documentation in the creation of a multi-section research paper or report with Table of Contents, Index, and Bibliography.

• Design and construct a form using multiple content controls.

• Apply advanced Excel tools such as pivot tables, pivot charts, and templates to workbooks.

• Create audience centric business documents to enhance readability.

• PSLO #2. DEMONSTRATE COMMON OFFICE ADMINISTRATION SKILLS.

• Integrate the features of working with tasks and schedules to organize both professional and personal information.

• Design and assess plans for backup and maintenance of Outlook files and information.

• Analyze trends in technologies and evaluate their effects on organizational data analysis.

• PSLO #3. DEMONSTRATE BASIC OFFICE COMMUNICATION SKILLS.

• Identify techniques to send, receive and manage email messages.

• Analyze business situations and determine appropriate methods to deliver negative and positive messages.

• PSLO #4. EXAMINE CUSTOMER SERVICE NEEDS AND REQUIREMENTS.

• Explain the elements of a service culture.

• Analyze strategies for promoting a positive service culture.

• Analyze the extent to which customer service is facilitated by the effective use of technology.

Career Information

Students who successfully complete the Business Information Worker Certificate are prepared for entry-level positions in general office environments in a variety of fields.

CIS - Computer Programmer-SQL Certificate

This certificate is designed for students who have completed the Database Analyst-SQL Certificate and aspire to be entry level programmers using the Structured Query Language (SQL). This is the second in a series of three certificate programs in Relational Database Management Systems. Courses taken towards the completion of the Database Analyst-SQL Certificate may be also be used towards this certificate.

Catalog Date: June 1, 2019

Certificate Requirements
<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CISC 310</td>
<td>Introduction to Computer Information Science</td>
<td>3</td>
</tr>
<tr>
<td>CISC 323</td>
<td>Linux Operating System</td>
<td>1</td>
</tr>
<tr>
<td>CISC 324</td>
<td>Intermediate Linux Operating System</td>
<td>1</td>
</tr>
<tr>
<td>CISP 300</td>
<td>Algorithm Design/Problem Solving</td>
<td>3</td>
</tr>
<tr>
<td>CISP 351</td>
<td>Introduction to Relational Database Design and SQL</td>
<td>3</td>
</tr>
<tr>
<td>CISP 352</td>
<td>Intermediate SQL</td>
<td>3</td>
</tr>
<tr>
<td>CISP 353</td>
<td>Application Development in a Client Server Environment</td>
<td>3</td>
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<td>A minimum of 2 units from the following:</td>
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<tr>
<td>CISP 370</td>
<td>Beginning Visual Basic (4)</td>
<td></td>
</tr>
<tr>
<td>or CISA 320</td>
<td>Introduction to Database Management (1)</td>
<td></td>
</tr>
<tr>
<td>or CISA 321</td>
<td>Intermediate Database Management (1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total Units:</td>
<td>19</td>
</tr>
</tbody>
</table>

**Student Learning Outcomes**

Upon completion of this program, the student will be able to:

- List and describe the hardware components of a computer system and differentiate among system and application software.
- Describe and assess the relationship of operating systems to database file management.
- Devise computerized solutions in the development of databases by applying a solid foundation of algorithmic principles.
- Compare and contrast hierarchical, network, and relational databases.
- Design, create, and administer relational databases.
- Design and develop tables, forms, queries, and reports using SQL.

**Career Information**

Computer Operator; Programmer; Computer Systems Specialist

**CIS - Database Analyst-SQL Certificate**
This certificate is designed for beginning students as well as technical professionals who aspire to design, create, or administer relational databases and create client applications. Successful students will be prepared to apply for entry-level positions for industry such as business analyst. The Database Analyst Certificate is the first in a series of three certificate programs designed for the entry-level student and business user.

**Catalog Date:** June 1, 2019

<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
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</tr>
</thead>
<tbody>
<tr>
<td>CISC 310</td>
<td>Introduction to Computer Information Science</td>
<td>3</td>
</tr>
<tr>
<td>CISC 323</td>
<td>Linux Operating System</td>
<td>1</td>
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<tr>
<td>CISC 324</td>
<td>Intermediate Linux Operating System</td>
<td>1</td>
</tr>
<tr>
<td>CISP 300</td>
<td>Algorithm Design/Problem Solving</td>
<td>3</td>
</tr>
<tr>
<td>CISP 351</td>
<td>Introduction to Relational Database Design and SQL</td>
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</tr>
<tr>
<td>CISP 352</td>
<td>Intermediate SQL</td>
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<td>Total Units:</td>
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<td>14</td>
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</table>

Upon completion of this program, the student will be able to:

- list the hardware components of a computer system and differentiate among system and application software.
- describe the relationship of operating systems to database file management.
- devise computerized solutions in the development of databases by applying a solid foundation of algorithmic principles.
- compare and contrast hierarchical, network, and relational databases.
- design, create, and administer relational databases.
- create client applications using structured query language (SQL).

**CIS - Database Design Certificate**

This certificate aims at preparing the students to understand the entire design, programming methodology and life cycle of databases. This certificate is designed for the student who requires programming skills in Relational Database Management Systems (RDBMS) and Structured Query Language (SQL) techniques using ORACLE, SQLServer and or Microsoft Access.
Certificate Requirements

<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>UNITS</th>
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</thead>
<tbody>
<tr>
<td>CISA 320</td>
<td>Introduction to Database Management</td>
<td>1</td>
</tr>
<tr>
<td>CISA 321</td>
<td>Intermediate Database Management</td>
<td>1</td>
</tr>
<tr>
<td>CISP 350</td>
<td>Database Programming</td>
<td>3</td>
</tr>
<tr>
<td>CISP 356</td>
<td>Relational Database Design and Information Retrieval</td>
<td>3</td>
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<tr>
<td></td>
<td>A minimum of 4 units from the following:</td>
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<tr>
<td>CISP 400</td>
<td>Object Oriented Programming with C++ (4)</td>
<td></td>
</tr>
<tr>
<td>or CISP 370</td>
<td>Beginning Visual Basic (4)</td>
<td></td>
</tr>
<tr>
<td>or CISP 360</td>
<td>Introduction to Structured Programming (4)</td>
<td></td>
</tr>
<tr>
<td>or CISP 300</td>
<td>Algorithm Design/Problem Solving (3)</td>
<td></td>
</tr>
<tr>
<td>or CISC 498</td>
<td>Work Experience in Computer Information Science - Core (1 - 4)</td>
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<tr>
<td></td>
<td>A minimum of 4 units from the following:</td>
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<tr>
<td>CISW 300</td>
<td>Web Publishing (3)</td>
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<tr>
<td>or CISW 400</td>
<td>Client-side Web Scripting (4)</td>
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<tr>
<td>or CISW 410</td>
<td>Middleware Web Scripting (4)</td>
<td></td>
</tr>
<tr>
<td>or CISC 306</td>
<td>Introduction to Web Page Creation (1)</td>
<td></td>
</tr>
<tr>
<td>or CISC 305</td>
<td>Introduction to the Internet (1)</td>
<td></td>
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<tr>
<td>Total Units:</td>
<td></td>
<td>16</td>
</tr>
</tbody>
</table>

Student Learning Outcomes

Upon completion of this program, the student will be able to:

- SLO# 1: Describe relational database technologies for desktop, enterprise and Internet platforms.
- Analyze and employ relational database technologies to solve common business problems using standard database principles and practices.
- SLO# 2: Explain and discuss database theory and principles.
- SLO# 3: Select Entity-Relationship diagrams to solve problems related to database design.
- SLO# 4: Devise computerized solutions in the development of databases by applying a solid foundation of algorithmic principles and SQL.
- Apply techniques of Structured Query Language Programming to solve problems related to information retrieval from relational databases.
- SLO# 5: Evaluate proposed database design solutions and create relational databases to meet stated objections.
CIS - Information Systems Security Certificate

This certificate is designed to give students currently employed as an Information Technology (IT) professional or those currently working on their Networking degree the additional skill sets necessary to work in this rapidly growing field. HIGHLIGHTS: Hands-on experience in a state-of-the-art computer center. Opportunities to work on specialized projects relating to computer information science, business and computer programming. Study in a field that has great employment opportunities and encompasses many careers.

Catalog Date: June 1, 2019

Certificate Requirements

<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CISC 310</td>
<td>Introduction to Computer Information Science</td>
<td>3</td>
</tr>
<tr>
<td>CISN 300</td>
<td>Network Systems Administration</td>
<td>3</td>
</tr>
<tr>
<td>CISN 304</td>
<td>Networking Technologies</td>
<td>3</td>
</tr>
<tr>
<td>CISS 310</td>
<td>Network Security Fundamentals</td>
<td>3</td>
</tr>
<tr>
<td>CISS 320</td>
<td>Implementing Network Security and Counter Measures</td>
<td>3</td>
</tr>
<tr>
<td>CISS 330</td>
<td>Implementing Internet Security and Firewalls</td>
<td>3</td>
</tr>
<tr>
<td>CISS 356</td>
<td>Introduction to Information Assurance</td>
<td>3</td>
</tr>
<tr>
<td>CISS 341</td>
<td>Implementing Windows Operating System Security (3)</td>
<td>3</td>
</tr>
<tr>
<td>or CISS 342</td>
<td>Implementing Linux Operating System Security (3)</td>
<td>3</td>
</tr>
<tr>
<td>or CISS 350</td>
<td>Disaster Recovery (3)</td>
<td>3</td>
</tr>
<tr>
<td>or CISS 360</td>
<td>Computer Forensics and Investigation (3)</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Units: 24

Student Learning Outcomes

Upon completion of this program, the student will be able to:

- SLO #01: Evaluate the different types of access control methods in particular authentication, authorization, and audit.
• SLO #02: Configure a firewall to prevent unauthorized access to a network or computer. Students will also learn how to allow access to key services while maintaining an organization's security.

• SLO #03: Evaluate, implement and manage secure remote-access technologies, such as Internet Detection Systems (IDS), which are powerful tools used for identifying and responding to network- and host-based intrusions.

• SLO #04: Critique the different ways to secure an operating system. Students will learn how to maintain the integrity, authenticity, availability, and privacy of data.

• SLO #05: Analyze risks to a network and be able to implement a workable security policy that protects information assets from potential intrusion, damage or theft.

Career Information

Information Security Systems Specialist; Computer Technician; Network Administrator; Network Systems Engineer—Windows; Internet Technician

CIS - Linux Systems Administrator Certificate

This certificate provides an introductory certification for students, who are interested in Linux. This certificate allows the Linux Professional the opportunity of honing their skills on basic Linux competencies encountered with a home or small business network. Students will start by understanding the basics surrounding a successful installation and configuration of a Linux server. Further courses will provide in-depth knowledge of command-line as well as other tools needed for successful daily system administration. Finally, the needed skill-sets to provide security for a Linux-based computer in a networked environment will be emphasized. This certificate will prepare students for the SAIR Level One Certified Linux Administrator certificate.

Guideline To Students: SAIR candidates on the Level One Certified Linux Administrator track are required to satisfy four certification exams.

Take these courses for these Level One Certified Linux Administrator skill sets:

CISN 300 (Linux) - Linux Installation and Configuration
CISN 302 (Linux) - Linux System Administration
CISN 303 - Linux Networking
CISS 342 - Linux Security, Privacy and Ethics

Highlights:

• Hands-on experience in a state-of-the-art computer center

• Opportunities to work on specialized projects relating to computer information science, business and computer programming.

• Study in a field that has great employment opportunities and encompasses many careers.
Certificate Requirements

<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CISC 323</td>
<td>Linux Operating System</td>
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</tr>
<tr>
<td>CISC 324</td>
<td>Intermediate Linux Operating System</td>
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</tr>
<tr>
<td>CISC 356</td>
<td>Introduction to Local Area Networks</td>
<td>1.5</td>
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<td>CISN 300</td>
<td>Network Systems Administration</td>
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<td>CISN 302</td>
<td>Intermediate Network Systems Administration</td>
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<td>CISN 303</td>
<td>Network Administration - Linux Server</td>
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<tr>
<td>CISS 342</td>
<td>Implementing Linux Operating System Security</td>
<td>3</td>
</tr>
<tr>
<td>Total Units:</td>
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<td>15.5</td>
</tr>
</tbody>
</table>

1(Linux)

2(Linux)

Student Learning Outcomes

Upon completion of this program, the student will be able to:

- SLO #01: Understand the concepts behind free software, run levels, daemons, the kernel, basic networking and devices.
- SLO #02: Install the operating system and configure aspects of it (hard drive, X Window, etc.). Know how the startup and shutdown function works, as well as the basics of disk layout, user accounts, and common processes.
- SLO #03: Comprehend the file system structure and nature of inodes. Know how to create a rescue media, monitor resources, and apply patches.
- SLO #04: Demonstrate the layout of a Local Area Network and how to configure it with TCP/IP. List different protocols and services and how they are tested, including how they are configured in a host, a network, or an adapter.
- SLO #05: Implement basic security methods, such as shadow passwords, log events, and be able to look for commonly known trouble spots.

Career Information

The main goal of this certificate in this program is to align the courses to the job skills necessary to be a SAIR Systems Administrator for a company in Sacramento region. This certificate is intended for a person already working in the IT field, who wants to gain additional skill-sets so s/he can stay competitive in this field.
CIS - Network Helpdesk Technician Certificate

This certificate provides students the information necessary to obtain an entry-level career in the field of networking. Upon completion of this certificate, students will understand helpdesk concepts and responsibilities, hardware and software troubleshooting, and technical communication skill-sets. The fundamentals of supporting end users and a Local Area Network (LAN) will also be emphasized.

**Catalog Date:** June 1, 2019

### Certificate Requirements

<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CISC 360</td>
<td>Information &amp; Communication Technology Essentials (A+)</td>
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</tr>
<tr>
<td>CISN 300</td>
<td>Network Systems Administration</td>
<td>3</td>
</tr>
<tr>
<td>CISN 301</td>
<td>Network Client Systems Administration</td>
<td>3</td>
</tr>
<tr>
<td>CISN 304</td>
<td>Networking Technologies</td>
<td>3</td>
</tr>
<tr>
<td>CISN 490</td>
<td>Networking Helpdesk Practicum</td>
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<tr>
<td>CISS 300</td>
<td>Introduction to Information Systems Security</td>
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</table>

A minimum of 3 units from the following:

<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CISC 498</td>
<td>Work Experience in Computer Information Science - Core (1 - 4)</td>
<td>3</td>
</tr>
<tr>
<td>CISN 302</td>
<td>Intermediate Network Systems Administration (3)</td>
<td></td>
</tr>
<tr>
<td>CISN 303</td>
<td>Network Administration - Linux Server (3)</td>
<td></td>
</tr>
<tr>
<td>CISS 310</td>
<td>Network Security Fundamentals (3)</td>
<td></td>
</tr>
</tbody>
</table>

Total Units: 20

### Student Learning Outcomes

Upon completion of this program, the student will be able to:

- Analyze the fundamentals of an operating system. Examine the relationship of the operating system to other applications programs (SLO #1).
- Demonstrate knowledge of networking technology. Judge the strengths and weaknesses of the different network operating systems and technologies (SLO #2).
- Analyze the effects of an application on a network operating system (SLO #3).
- Analyze the effects of network intruders and viruses on an application and an operating system (SLO #4).
CIS - Object Oriented Software Development Certificate

This certification will enhance students' proficiency in the development by using Object Oriented programming languages. After this certification, the student should be able to use Java, C++, C#, and etc. to develop object oriented Programs.

**Catalog Date:** June 1, 2019

Certificate Requirements

<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CISP 401</td>
<td>Object Oriented Programming with Java</td>
<td>4</td>
</tr>
<tr>
<td>CISP 402</td>
<td>Java - Data Handling</td>
<td>4</td>
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<tr>
<td></td>
<td>A minimum of 8 units from the following:</td>
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<tr>
<td>CISP 370</td>
<td>Beginning Visual Basic (4)</td>
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<tr>
<td>CISP 400</td>
<td>Object Oriented Programming with C++ (4)</td>
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<tr>
<td>CISP 405</td>
<td>Object Oriented Programming using C# on Visual Studio .NET (4)</td>
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</tr>
<tr>
<td>Total Units:</td>
<td></td>
<td>16</td>
</tr>
</tbody>
</table>

Enrollment Eligibility

To be eligible for enrollment in the program, the student must meet the following criteria:

- Pass CISP360, Introduction to Structured Programming, or equivalent course with a C or better.

Student Learning Outcomes

Upon completion of this program, the student will be able to:

- Formulate problems as steps so be able to solve systematically.
- Describe the principles of object oriented programming.
- Use structure programming skills proficiently in an object oriented program.
Apply the concepts of object oriented programming skills such as reusability, portability, data encapsulation, inheritance, polymorphism and etc. to a program.

- Design and develop programs with Graphical User Interfaces.
- Use an object oriented language to develop solutions for real life projects in a team work environment.

Career Information

This certificate is designed to prepare students for advancing their study in game programming, computer science, computer engineering, software engineering, computer graphics, and other related fields for undergraduate and graduated study. It could be used for students to improve their job skills in high tech computer science, computer programming, game programming, research, teaching, etc.

CIS - Programming in C/C++ Certificate

This CIS - Programming in C/C++ certificate provides students an advanced level of C/C++ programming skill. It will prepare students in advancing their career or transferring to four-year Universities.

HIGHLIGHTS

- Hands-on experience in a state-of-the-art computer center
- Opportunities to work on specialized projects relating to computer information science, business and computer programming
- Study in a field that has great employment opportunities and encompasses many careers

Catalog Date: June 1, 2019

Certificate Requirements

<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CISP 300</td>
<td>Algorithm Design/Problem Solving</td>
<td>3</td>
</tr>
<tr>
<td>CISP 360</td>
<td>Introduction to Structured Programming</td>
<td>4</td>
</tr>
<tr>
<td>CISP 400</td>
<td>Object Oriented Programming with C++</td>
<td>4</td>
</tr>
<tr>
<td>CISP 430</td>
<td>Data Structures</td>
<td>4</td>
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<td>A minimum of 4 units from the following:</td>
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<tr>
<td>CISP 370</td>
<td>Beginning Visual Basic (4)</td>
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<tr>
<td>or CISP 401</td>
<td>Object Oriented Programming with Java (4)</td>
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<tr>
<td>or CISP 405</td>
<td>Object Oriented Programming using C# on Visual Studio .NET (4)</td>
<td></td>
</tr>
<tr>
<td>Total Units:</td>
<td></td>
<td>19</td>
</tr>
</tbody>
</table>
Upon completion of this program, the student will be able to:

- Apply Object and Structure programming in programs
- Use a C/C++ programming development tool to develop programs.
- Communicate and analyze programming problems, and determine what object-oriented programming approach would be most appropriate to resolve them.

Career Information

Computer Operator; Applications Software Specialist; Programmer; Data Entry Specialist; Systems Analyst, and Database Administrator.

CIS - Relational Database Administration Certificate

The Relational Database Administration Certificate is designed for a person who is responsible for interacting with SQL Programmers, Database Designers, Systems Administrators, and Network Engineers as well as the day-to-day operation of a Relational Database Management System. This course of study is appropriate for an entry level Database Administration position. Courses used towards the completion of the Computer Programmer - SQL certificate may also be used to satisfy the requirements of this certificate.

Catalog Date: June 1, 2019

Certificate Requirements

<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CISC 310</td>
<td>Introduction to Computer Information Science</td>
<td>3</td>
</tr>
<tr>
<td>CISA 320</td>
<td>Introduction to Database Management</td>
<td>1</td>
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<tr>
<td>CISA 321</td>
<td>Intermediate Database Management</td>
<td>1</td>
</tr>
<tr>
<td>CISC 323</td>
<td>Linux Operating System</td>
<td>1</td>
</tr>
<tr>
<td>CISC 324</td>
<td>Intermediate Linux Operating System</td>
<td>1</td>
</tr>
<tr>
<td>CISP 300</td>
<td>Algorithm Design/Problem Solving</td>
<td>3</td>
</tr>
<tr>
<td>CISP 351</td>
<td>Introduction to Relational Database Design and SQL</td>
<td>3</td>
</tr>
<tr>
<td>CISP 352</td>
<td>Intermediate SQL</td>
<td>3</td>
</tr>
<tr>
<td>CISP 354</td>
<td>Introduction to Relational Database Administration</td>
<td>3</td>
</tr>
<tr>
<td>Total Units:</td>
<td></td>
<td>19</td>
</tr>
</tbody>
</table>
Student Learning Outcomes

Upon completion of this program, the student will be able to:

- Analyze and list the hardware components of a computer system and differentiate among system and application software.
- Plan and design tables, forms, queries, and reports using office database application software.
- Assess and design multi-table forms, establish table relationships.
- Describe the relationship of operating systems to database file management.
- Devise computerized solutions in the development of databases by applying a solid foundation of algorithmic principles.
- Compare and contrast hierarchical, network, and relational databases.
- Demonstrate ability to design, create, and administer relational databases.
- Create client applications using structured query language (SQL).

Career Information

Computer Operator; Applications Software Specialist; Systems Analyst; Programmer; Data Entry Specialist; Computer Systems Specialist; Computer Technician

CIS - Server Administrator Certificate

This certificate is designed for Network Help-desk Technicians, who want to gain additional skill-sets to become a Windows Server Administrator. Some of the skill-sets that are necessary for this job include the ability to deploy, install, and configure the components of a network system based on the Microsoft Windows platform and Microsoft server software; the ability to manage the components of a network system on an ongoing basis; the ability to monitor and optimize the components of a network system; and the ability to diagnose and resolve problems regarding the components of a network system.

HIGHLIGHTS:

- Hands-on experience in a state-of-the-art computer lab.
- Opportunities to work on specialized projects relating to computer information science, business and computer programming.
- Study in a field that has great employment opportunities and encompasses many careers.
GUIDELINES TO STUDENTS:

- Microsoft Certified Solutions Associate (MCSA) certification requires three Microsoft exams (70-410, 70-411 and 70-412), which are covered in this certificate.

- It is recommended that students use their best judgment and talk to a counselor or a CIS instructor to help guide them with their selection of the appropriate courses for their personal and/or professional needs.

Catalog Date: June 1, 2019

Certificate Requirements

<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CISC 360</td>
<td>Information &amp; Communication Technology Essentials (A+)</td>
<td>4</td>
</tr>
<tr>
<td>CISN 300</td>
<td>Network Systems Administration</td>
<td>3</td>
</tr>
<tr>
<td>CISN 302</td>
<td>Intermediate Network Systems Administration</td>
<td>3</td>
</tr>
<tr>
<td>CISN 304</td>
<td>Networking Technologies</td>
<td>3</td>
</tr>
<tr>
<td>CISN 306</td>
<td>Advanced Network Systems Administration</td>
<td>3</td>
</tr>
<tr>
<td>CISS 300</td>
<td>Introduction to Information Systems Security</td>
<td>1</td>
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<td>A minimum of 9 units from the following:</td>
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<tr>
<td>CISN 301</td>
<td>Network Client Systems Administration (3)</td>
<td></td>
</tr>
<tr>
<td>CISN 303</td>
<td>Network Administration - Linux Server (3)</td>
<td></td>
</tr>
<tr>
<td>CISN 374</td>
<td>Messaging Server Administration (3)</td>
<td></td>
</tr>
<tr>
<td>CISN 378</td>
<td>Database Administration for Microsoft SQL Server (3)</td>
<td></td>
</tr>
<tr>
<td>CISS 310</td>
<td>Network Security Fundamentals (3)</td>
<td></td>
</tr>
<tr>
<td>Total Units:</td>
<td></td>
<td>26</td>
</tr>
</tbody>
</table>

Student Learning Outcomes

Upon completion of this program, the student will be able to:

- SLO #01: Manage, implement, and maintain the typically complex computing environment of medium- to large-sized companies
- SLO #02: Manage and maintain a Windows server environment
- SLO #03: Manage, implement, and maintain a Windows server network infrastructure

Career Information

CIS - Web Programming Certificate

This certificate prepares students to design, develop, support, and maintain corporate level Web pages and full Web sites at the level of the Intranet or Internet. Additionally, this certificate will prepare students to design and develop database management applications to support Web-based commercial objectives.

HIGHLIGHTS

- Hands-on experience in a state-of-the-art computer center
- Opportunities to work on specialized projects relating to computer information science, business and computer programming
- Study in a field that has great employment opportunities and encompasses many careers

Catalog Date: June 1, 2019

Certificate Requirements

<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUS 100</td>
<td>English for the Professional (3)</td>
<td>3</td>
</tr>
<tr>
<td>CISP 300</td>
<td>Algorithm Design/Problem Solving</td>
<td>3</td>
</tr>
<tr>
<td>CISA 320</td>
<td>Introduction to Database Management</td>
<td>1</td>
</tr>
<tr>
<td>CISC 308</td>
<td>Exploring Computer Environments and the Internet (1)</td>
<td>1</td>
</tr>
<tr>
<td>or CISC 323</td>
<td>Linux Operating System (1)</td>
<td></td>
</tr>
<tr>
<td>CISC 324</td>
<td>Intermediate Linux Operating System</td>
<td>1</td>
</tr>
<tr>
<td>CISW 300</td>
<td>Web Publishing</td>
<td>3</td>
</tr>
<tr>
<td>CISW 410</td>
<td>Middleware Web Scripting</td>
<td>4</td>
</tr>
<tr>
<td>CISP 360</td>
<td>Introduction to Structured Programming</td>
<td>4</td>
</tr>
<tr>
<td>CISP 350</td>
<td>Database Programming</td>
<td>3</td>
</tr>
<tr>
<td>CISW 400</td>
<td>Client-side Web Scripting</td>
<td>4</td>
</tr>
<tr>
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<td>A minimum of 5 units from the following:</td>
<td>5</td>
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<tr>
<td>CISP 440</td>
<td>XML: Introduction to Extensible Markup Language (2)</td>
<td></td>
</tr>
<tr>
<td>CISP 402</td>
<td>Intermediate JavaScript (2)</td>
<td></td>
</tr>
<tr>
<td>CISP 310</td>
<td>Advanced Web Publishing (4)</td>
<td></td>
</tr>
<tr>
<td>CISA 321</td>
<td>Intermediate Database Management (1)</td>
<td></td>
</tr>
<tr>
<td>CISW 304</td>
<td>Cascading Style Sheets (2)</td>
<td></td>
</tr>
<tr>
<td>CISW 308</td>
<td>Mobile Web Development (2)</td>
<td></td>
</tr>
</tbody>
</table>

Total Units: 32
Student Learning Outcomes

Upon completion of this program, the student will be able to:

- Design, develop, support, and maintain professional Web pages.
- Demonstrate knowledge of web-related technology and media applications.
- Be competent evaluators and users of the World Wide Web.
- Adapt to technological changes and select a current solution for a given problem.
- Understand how to deal with interoperability between different products, systems, and platforms.
- Find effective solutions to maintaining and supporting web sites and related resources.

Career Information

Computer Operator; Applications Software Specialist; Programmer; Data Entry Specialist; Internet Technician

CIS - Web Publishing Certificate

This certificate is designed to give students the benefits of hands-on training in Web Page Design and Publication, Internet usage, and proficiency with web-related media applications.

HIGHLIGHTS

- Hands-on experience in a state-of-the-art computer center
- Opportunities to work on specialized projects relating to computer information science, business and computer programming
- Study in a field that has great employment opportunities and encompasses many careers

Catalog Date: June 1, 2019

Certificate Requirements
<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUS 100</td>
<td>English for the Professional (3)</td>
<td>3</td>
</tr>
<tr>
<td>CISC 308</td>
<td>Exploring Computer Environments and the Internet (1)</td>
<td>1(^1)</td>
</tr>
<tr>
<td>or CISC 323</td>
<td>Linux Operating System (1)</td>
<td></td>
</tr>
<tr>
<td>CISW 350</td>
<td>Imaging for the Web</td>
<td>1</td>
</tr>
<tr>
<td>CISW 300</td>
<td>Web Publishing</td>
<td>3</td>
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<td>A minimum of 3 units from the following:</td>
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<tr>
<td>ART 301</td>
<td>Digital Drawing and Composition (3)</td>
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<tr>
<td>PHOTO 400</td>
<td>Digital Imaging (3)</td>
<td></td>
</tr>
<tr>
<td>ARTNM 324</td>
<td>Digital Design (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A minimum of 4 units from the following:</td>
<td>4(^2)</td>
</tr>
<tr>
<td>CISC 306</td>
<td>Introduction to Web Page Creation (1)</td>
<td></td>
</tr>
<tr>
<td>CISW 321</td>
<td>Web Site Development using Dreamweaver (3)</td>
<td></td>
</tr>
<tr>
<td>CISW 310</td>
<td>Advanced Web Publishing (4)</td>
<td></td>
</tr>
<tr>
<td>CISA 340</td>
<td>Presentation Graphics (2)</td>
<td></td>
</tr>
<tr>
<td>CISW 400</td>
<td>Client-side Web Scripting (4)</td>
<td></td>
</tr>
<tr>
<td>CISW 410</td>
<td>Middleware Web Scripting (4)</td>
<td></td>
</tr>
<tr>
<td>CISW 355</td>
<td>Web Imaging Projects (2)</td>
<td></td>
</tr>
<tr>
<td>CISW 304</td>
<td>Cascading Style Sheets (2)</td>
<td></td>
</tr>
<tr>
<td>CISW 326</td>
<td>Intermediate Web Site Development using Dreamweaver (3)</td>
<td></td>
</tr>
<tr>
<td>CISW 308</td>
<td>Mobile Web Development (2)</td>
<td></td>
</tr>
<tr>
<td>Total Units:</td>
<td></td>
<td>15</td>
</tr>
</tbody>
</table>

\(^1\)Select either Windows (through CISC 308) or Linux (through CISC 323) operating system.

\(^2\)CISW 310 is recommended to meet this 4-unit requirement.

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**Student Learning Outcomes**

Upon completion of this program, the student will be able to:

- Demonstrate knowledge of web-related technology and media applications.
- Be competent evaluators and users of the World Wide Web.
- Adapt to technological changes and select a current solution for a given problem.
- Understand how to deal with interoperability between different products, systems, and platforms.
- Find effective solutions to maintaining and supporting web sites and related resources.
Career Information

Applications Software Specialist; Data Entry Specialist; Computer Technician; Internet Technician

Certificates

CIS - Information Technology Certificate
This certificate allows students to acquire basic core Information Technology competencies that will prepare them for a career in Computer Networking, Cybersecurity, and related fields.

Catalog Date: June 1, 2019

Certificate Requirements

<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CISC 310</td>
<td>Introduction to Computer Information Science</td>
<td>3</td>
</tr>
<tr>
<td>CISC 360</td>
<td>Information &amp; Communication Technology Essentials (A+)</td>
<td>4</td>
</tr>
<tr>
<td>CISN 304</td>
<td>Networking Technologies</td>
<td>3</td>
</tr>
<tr>
<td>CISP 370</td>
<td>Beginning Visual Basic (4)</td>
<td>4</td>
</tr>
<tr>
<td>or CISP 360</td>
<td>Introduction to Structured Programming (4)</td>
<td></td>
</tr>
</tbody>
</table>

A minimum of 6 units from the following:

<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CISN 300</td>
<td>Network Systems Administration (3)</td>
<td>3</td>
</tr>
<tr>
<td>CISP 351</td>
<td>Introduction to Relational Database Design and SQL (3)</td>
<td>3</td>
</tr>
<tr>
<td>CISS 310</td>
<td>Network Security Fundamentals (3)</td>
<td>3</td>
</tr>
<tr>
<td>CISS 356</td>
<td>Introduction to Information Assurance (3)</td>
<td>3</td>
</tr>
<tr>
<td>CISS 360</td>
<td>Computer Forensics and Investigation (3)</td>
<td>3</td>
</tr>
<tr>
<td>BUS 310</td>
<td>Business Communications (3)</td>
<td>3</td>
</tr>
</tbody>
</table>

A minimum of 4 units from the following:

<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT 300</td>
<td>Introduction to Probability and Statistics (4)</td>
<td>4</td>
</tr>
<tr>
<td>MATH 341</td>
<td>Calculus for Business and Economics (4)</td>
<td>4</td>
</tr>
<tr>
<td>MATH 343</td>
<td>Modern Business Mathematics (4)</td>
<td>4</td>
</tr>
<tr>
<td>MATH 400</td>
<td>Calculus I (5)</td>
<td>5</td>
</tr>
</tbody>
</table>

Total Units: 24

Student Learning Outcomes

Upon completion of this program, the student will be able to:
• Apply fundamental knowledge of computing and the current use of technology techniques, skills, and tools necessary for the computing practice. (PSLO #1, PSLO #5)

• Evaluate and solve business problems with technology solutions using qualitative and quantitative information. (PSLO #1)

• Assess user needs in the selection, creation, evaluation and administration of computer-based information systems. (PSLO #3)

• Demonstrate appreciation of the Information Technology career field and the need to be lifelong learners. (PSLO #7)

Career Information

The Certificate in Information Technology prepares students to either enter the workforce as an entry-level computer or network support technician. Several CSUs currently offer baccalaureate IT or CT programs, as do several private universities. More CSUs are already working on build upper division programs based on the recently approved IT Model Curriculum for California Community Colleges.

Cybersecurity Certificate

This one-year and fully-online certificate provides graduates with the skills needed to defend networks and information systems against cyber-attacks. Students receive extensive hands-on experience and develops the knowledge and abilities necessary to succeed in protection of an organization’s data and operations. It is a rigorous program designed to help students master the fundamentals of cybersecurity by applying industry-accepted and emerging practices to solve real-world security problems. Upon completion of the program, students will be able to evaluate security trends, recognize best practices, and understand Information Technology security products and threats. Some career opportunities associated with this degree include: security analyst, network systems security administrator, security policy analyst, and more.

Catalog Date: June 1, 2019

Certificate Requirements

<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CISC 310</td>
<td>Introduction to Computer Information Science</td>
<td>3¹</td>
</tr>
<tr>
<td>CISC 360</td>
<td>Information &amp; Communication Technology Essentials (A+)</td>
<td>4²</td>
</tr>
<tr>
<td>CISN 304</td>
<td>Networking Technologies</td>
<td>3³</td>
</tr>
<tr>
<td>CISN 341</td>
<td>CISCO Networking Academy (CCNA)™: Networking Theory and Routing Technologies</td>
<td>3.5⁴</td>
</tr>
<tr>
<td>CISN 300</td>
<td>Network Systems Administration (3)</td>
<td>3⁵</td>
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<tr>
<td>CISS 310</td>
<td>Network Security Fundamentals</td>
<td>3⁶</td>
</tr>
<tr>
<td>CISS 316</td>
<td>Cisco Networking Academy™: CCNA Cybersecurity Operations</td>
<td>3⁷</td>
</tr>
<tr>
<td>COURSE CODE</td>
<td>COURSE TITLE</td>
<td>UNITS</td>
</tr>
<tr>
<td>-------------</td>
<td>-------------------------------------------------------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>CISS 327</td>
<td>Cisco Networking Academy™: CCNA Security: Implementing Network Security</td>
<td>3.5^8</td>
</tr>
<tr>
<td>Total Units</td>
<td></td>
<td>26</td>
</tr>
</tbody>
</table>

1. CompTIA IT Fundamentals
2. CompTIA A+
3. CompTIA Network+
4. CISCO CCENT
5. or CISN 303 with the professor's permission
6. CompTIA Security+
7. CCNA CyberOPS
8. CCNA Security

**Enrollment Eligibility**

To be eligible for enrollment in the program, the student must meet the following criteria:

- Students enrolling in the collaborative program would complete the program in a cohort model taking courses from three or more colleges.
- Students are required to complete the “Quest for Success” modules prior to enrollment in a cohort.
- Students must participate in student support services while enrolled in the collaborative program.

**Enrollment Process**

Eligible students are selected for the program according to the following steps:

- First ten students, who have met the enrollment process, are eligible for the program.

**Student Learning Outcomes**

Upon completion of this program, the student will be able to:
- Design and produce business information systems solutions incorporating current Information Technology, trends, security, and best practices (PSLO 1).
- Execute Linux system commands from either a keyboard or a shell script using correct command syntax (PSLO 2).
- Analyze and implement security concepts and security policies (PSLO 3).
- Analyze common threats to and vulnerabilities of computer systems and networks (PSLO 4).
- Implement and manage Cisco secure networks (PSLO 5).
- Implement network perimeter defense (PSLO 6).

### Career Information
Some career opportunities associated with this degree include: security analyst, network systems security administrator, security policy analyst, and more.

### Computer Information Science - Applications (CISA)

#### CISA 305 Beginning Word Processing

<table>
<thead>
<tr>
<th>Units:</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours:</td>
<td>36 hours LEC</td>
</tr>
<tr>
<td>Prerequisite:</td>
<td>None.</td>
</tr>
<tr>
<td>Advisory:</td>
<td>BUSTEC 302, CISC 302, or CISC 310</td>
</tr>
<tr>
<td>Transferable:</td>
<td>CSU</td>
</tr>
<tr>
<td>Catalog Date:</td>
<td>June 1, 2019</td>
</tr>
</tbody>
</table>

This course introduces students to fundamental and intermediate word processing skills. The course includes basic word processing operations: formatting business documents, editing, saving, retrieving, printing text, and creating and editing simple tables. The course also includes intermediate operations: inspecting documents for hidden properties, inserting and formatting graphic elements, managing reference markers, and merging multiple documents.

### Student Learning Outcomes

Upon completion of this course, the student will be able to:

- **SLO1**: CREATE PROFESSIONAL LOOKING BUSINESS DOCUMENTS USING WORD PROCESSING SOFTWARE
  
  Demonstrate ability to analyze needs and create letters, envelopes, memorandums and reports by planning, entering text, correcting, formatting, saving and printing business documents.

- **SLO2**: EDIT AND FORMAT BUSINESS DOCUMENTS USING WORD PROCESSING COMMANDS
Demonstrate ability to edit and format documents using word processing commands and features such as: setting margins, tabs, indents and alignment; changing fonts, font sizes, and font styles; finding, replacing, moving and copying text; selecting, inserting and deleting text; creating borders, symbols, bullets and numbered lists; creating and editing tables.

SLO3: DEMONSTRATE USAGE OF THE MAIL MERGE FUNCTION

Integrate source data from different applications into business documents to create multiple, individualized copies.

CISA 306 Intermediate Word Processing

| Units: | 2 |
| Hours: | 36 hours LEC |
| Prerequisite: | CISA 305 with a grade of "C" or better |
| Transferable: | CSU |
| Catalog Date: | June 1, 2019 |

This is a course designed to build upon previous training in the use of word processing. The course covers intermediate to advanced word processing features, such as styles, macros, outlines, document notations, forms, charts, and advanced mail merge techniques. Also covered are integrating word processing with other applications and creating documents for use on the Internet, i.e. web pages and e-mail attachments in word processing. Advanced business document formatting will also be included.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- **SLO1: EDIT AND FORMAT DOCUMENTS USING INTERMEDIATE AND ADVANCED WORD PROCESSING COMMANDS**
  - Demonstrate ability to edit and format documents using intermediate and advanced word processing commands and features such as: creating, editing and applying styles; merging a main document with a data source file; using templates and wizards to create documents; recording and running a macro; creating and using document notations; generating and modifying outlines, tables of contents and indexes; creating and modifying forms.

- **SLO2: INTEGRATE WORD PROCESSING WITH OTHER APPLICATIONS AND CREATE DOCUMENTS FOR SHARED USE**
  - Demonstrate ability to integrate word processing with other applications by embedding and linking a spreadsheet object into a word processing document.
  - Demonstrate ability to use word processing commands and features to create Web pages such as: creating and editing hyperlinks; applying background effects; saving a word processing document as a Web page; formatting a Web page.
  - Demonstrate ability to compare and combine multiple document versions, track changes, and manage document properties.
• SLO3: INSERT AND MODIFY CUSTOM DOCUMENT ELEMENTS
• Demonstrate ability to insert and modify building blocks, field codes and properties, and document controls.

CISA 308 Exploring Word Processing and Presentation Software

| Units: | 1 |
| Hours: | 18 hours LEC |
| Prerequisite: | None. |
| Transferable: | CSU |
| Catalog Date: | June 1, 2019 |

The course introduces the student to the most widely used word processing and presentation software, Microsoft Word and PowerPoint. The basic features and skills of creating, editing, formatting, inserting tables and graphics and enhancing Word documents and PowerPoint presentations are covered.

| Student Learning Outcomes |

Upon completion of this course, the student will be able to:

• SLO1: UTILIZE EFFICIENT TECHNIQUES IN CREATING AND FORMATTING TYPICAL BUSINESS DOCUMENTS AND/OR PRESENTATIONS
• Analyze document requirements and use appropriate features when creating business documents that require the integration of text, charts, and/or graphics for distribution or presentation.
• Edit content by using various features such as cut/copy/paste, sort, and merge.
• Format documents using basic editing features, e.g., margins, headers/footers and page orientation in addition to applying attributes that adjust the style, size and appearance of characters.
• Create and format tables for efficient data display utilizing options in table properties.
• Evaluate and analyze appropriate layout and design of documents for specific audiences.

CISA 315 Introduction to Electronic Spreadsheets
This course is designed to introduce the student to the use of spreadsheet programs. The course will include: designing a spreadsheet, developing formulas for automatic calculations, using special functions, developing what-if models, producing charts, performing spreadsheet data base functions, and producing reports. Students will be using mathematical concepts and skills.

<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upon completion of this course, the student will be able to:</td>
</tr>
<tr>
<td>• CREATE A PROFESSIONAL LOOKING SPREADSHEET THAT INCLUDES ACCURATE FORMULAS, FUNCTIONS, AND FORMATTING (SLO 1).</td>
</tr>
<tr>
<td>• Produce and edit data entries in a worksheet using text, numbers, formulas, and functions.</td>
</tr>
<tr>
<td>• Prepare and produce effective worksheet presentations using appropriate formats.</td>
</tr>
<tr>
<td>• Apply the appropriate use absolute and relative addressing when copying formulas.</td>
</tr>
<tr>
<td>• ANALYZE DATA AND APPLY APPROPRIATE VISUAL DISPLAYS TO A SPREADSHEET (SLO 2).</td>
</tr>
<tr>
<td>• Evaluate worksheet data to answer what-if questions.</td>
</tr>
<tr>
<td>• Develop and modify charts.</td>
</tr>
<tr>
<td>• DEVELOP AND ANALYZE DATABASE FUNCTIONS AND USE ANALYTICAL TOOLS TO SUMMARIZE DATA (SLO 3).</td>
</tr>
<tr>
<td>• utilize Database functions and create and analyze Pivot-Tables.</td>
</tr>
<tr>
<td>• ANALYZE AND SUMMARIZE DATA USING CONSOLIDATED SPREADSHEETS WITH LINKED REFERENCES (SLO 4).</td>
</tr>
<tr>
<td>• Structure spreadsheets to utilize multiple worksheets simultaneously.</td>
</tr>
<tr>
<td>• Combine and link information from multiple worksheets and workbooks.</td>
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</tbody>
</table>

CISA 316 Intermediate Electronic Spreadsheets
This course introduces students to the intermediate features of spreadsheet programs. The course will cover macros, data tables and lookup functions, logical expressions as well as advanced file operations, functions, and convenience commands. Students will follow spreadsheet templates and design their own sheets.

### Student Learning Outcomes

Upon completion of this course, the student will be able to:

- **ANALYZE AND SOLVE PROBLEMS USING ADVANCED FUNCTIONS IN SPREADSHEETS (SLO 1).**
- Understand and utilize advanced functions including logical functions, lookup tables and functions, filtering, and database functions.
- Understand and utilize advanced financial functions for financial analysis.
- **UNDERSTAND THE PROCESSES USED TO AUTOMATE SPREADSHEET APPLICATIONS WITH RANGES, VALIDATION, AND MACROS (SLO 2).**
  - Understand and use Data validation tools.
  - Understand and utilize Range Names functions.
  - Utilize spreadsheet protection functions.
  - Understand and Use MACROS.
- **EVALUATE AND APPLY AN UNDERSTANDING OF THE USE OF ADVANCED SPREADSHEET APPLICATIONS FOR PROBLEM SOLVING AND ANALYSIS (SLO 3).**
  - Utilize Data Tables (One-Input and Two-Input) and Scenario Management functions.
  - Utilize spreadsheet tools to facilitate Decision Making (Solver and Goal Seek).
- **UNDERSTAND THE PROCESS TO IMPORT DATA INTO SPREADSHEETS FROM EXTERNAL APPLICATIONS AND DEVELOP THE ABILITY TO UTILIZE PROGRAMMING TECHNIQUES TO MODIFY SPREADSHEET APPLICATIONS (SLO 4).**
  - Understand and utilize the importing of data into spreadsheets from external databases and the Internet and utilize the data for analysis.
  - Develop a basic understanding of the Visual Basic Editor to develop and modify spreadsheet applications.
The course acquaints the student with widely used spreadsheet software. The basic features and skills of editing a workbook, using basic formulas and functions in a workbook, formatting a workbook, inserting and formatting charts and graphics in a workbook and analyzing and presenting a workbook are covered.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- **SLO #1: EFFECTIVELY UTILIZE ELECTRONIC SPREADSHEET SOFTWARE TO INPUT AND MANAGE DATA**
  - Plan, build, test and document worksheets
  - Differentiate methods for printing all or portions of a worksheet or workbook using standard or customized layouts for headers, footers and other documentation as well as special designs, borders, color and/or patterns, and number formats
  - Organize, copy, or move worksheet entries with an understanding of relative, mixed and absolute cell references

- **SLO #2: CALCULATE AND ANALYZE DATA WITH VARIOUS ELECTRONIC SPREADSHEET FEATURES AND TOOLS**
  - Create formulas and manipulate data using mathematical operators, and arrive at mathematical solutions using financial, statistical and logical functions
  - Demonstrate ability to perform basic "what-if" analysis and use Goal Seek to analyze worksheet data
  - Incorporate basic sorting, filtering, and summarizing of data using menus, toolbars, and pivot tables
  - Research the Internet and use the browse, search and hyperlink capabilities in addition to web query features to get real-time spreadsheet data from web sites

- **SLO #3: ARRANGE AND APPLY APPROPRIATE VISUAL DISPLAYS FOR OPTIMAL DATA PRESENTATION**
  - Choose and construct various types of charts based on the most effective and appropriate display for the given data
  - Employ page breaks, headers and footers, gridlines, row and column headings, and page orientation to best display information

CISA 320 Introduction to Database Management
This course is designed to introduce the student to the use of database management programs on the computer. The course will include designing a database; accessing, searching and updating files; and designing and producing printed reports. Students will be reading and interpreting written and oral instructions of a technical nature.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- UNDERSTAND THE BASIC FUNCTIONS OF A RELATIONAL DATABASE (SLO 1)
  - Understand database structures and types.
  - Evaluate the appropriate use of different elements of a database.
- UTILIZE A RELATIONAL DATABASE TO INPUT, RETRIEVE AND REPORT DATA (SLO 2)
  - Analyze the needs and requirements of a database and design an appropriate structure.
  - Understand basic database functions such as developing a query and sorting, searching, filtering, and calculating data.
  - Design and produce database reports.

CISA 321 Intermediate Database Management

This course will extend the capabilities of students who have started to use a microcomputer database. Topics and laboratory will include complex relational databases, form design, intermediate report design, advanced queries, OLE objects, macros and an introduction to visual programming.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- CISA 320 with a grade of "C" or better
  - Prerequisite:
  - CSU
  - Transferable:
  - June 1, 2019

Units: 1
Hours: 18 hours LEC
Prerequisite: CISC 302 or 310
Advisory: CSU
Transferable: CSU
Catalog Date: June 1, 2019
DEVELOP AN UNDERSTANDING OF ADVANCED QUERIES IN A RELATIONAL DATABASE (SLO 1)
- Design complex queries using advanced processes such as: Pattern Match, List of Values Match, Not Operators, Parameter queries, and Cross-tab queries.
- Incorporate Lookup functions to simplify data retrieval.
- Integrate Data Validation rules to limit errors in databases.

DESIGN AND DEVELOP CUSTOM FORMS FOR RELATIONAL DATABASES (SLO 2)
- Create custom forms so that database input documents reflect non-database input sources.
- Structure sub-forms so that data from related tables is viewable on a single form.

DESIGN AND DEVELOP CUSTOM REPORTS FOR RELATIONAL DATABASES (SLO 3)
- Plan customized reports to improve the presentation of database information.
- Design queries to complete data required for custom reports.

CISA 340 Presentation Graphics

| Units: | 2 |
| Hours: | 36 hours LEC |
| Prerequisite: | None. |
| Advisory: | CISC 302 or 310 |
| Transferable: | CSU |
| Catalog Date: | June 1, 2019 |

This course is an introduction to the use of the computer to generate graphics used in business. Topics covered include: hardware (screens, printers, input devices), software (paint, chart, CAD), types of graphics (pictures, graphs, charts, designs).

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- SLO 1: UTILIZE PRESENTATION GRAPHICS SOFTWARE FOR PRESENTATION DEVELOPMENT
  - develop pictures, graphs, charts, and designs using the software.
  - integrate graphics, animation, text, and charts in the development of a presentation.
- SLO 2: DISTINGUISH BETWEEN VARIOUS FILES AND SYSTEM REQUIREMENTS
  - demonstrate understanding of fundamental hardware and software concepts including terminology, evaluation, installation and use.
  - evaluate types of graphics available, types of files, and system requirements.
Computer Information Science - Core (CISC)

CISC 295 Independent Studies in Computer Information Science - Core

<table>
<thead>
<tr>
<th>Units:</th>
<th>1 - 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours:</td>
<td>54 - 162 hours LAB</td>
</tr>
<tr>
<td>Prerequisite:</td>
<td>None.</td>
</tr>
<tr>
<td>Catalog Date:</td>
<td>June 1, 2019</td>
</tr>
</tbody>
</table>

An independent studies project involves an individual student or small group of students in study, research, or activities beyond the scope of regularly offered courses. See the current catalog section of "Special Studies" for full details of Independent Studies.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- **SLO #1:** Actively engage in intellectual inquiry beyond that required in order to pass a course of study (College Wide Learning Outcome – Area 4).
- **SLO #2:** Utilize modes of analysis and critical thinking to apply theoretical perspectives and/or concepts in the major discipline of study to significant problems and/or educational activities (College Wide Learning Outcome – Area 3).
- **SLO #3:** Communicate a complex understanding of content matter of the major discipline of study (College Wide Outcome – Area 3).
- **SLO #4:** Identify personal goals and pursue these goals effectively (College Wide Outcome – Area 4).
CISC 302 Computer Familiarization

This is an introductory course to provide general knowledge on how computers work, computer terminology and the impact of computers on society and the work environment. Beginning level hands-on instruction using an operating system, word processing software, spreadsheet software, database software, email and the Internet will be emphasized. Students will be reading and interpreting written and oral instructions of a technical nature. This course is the same as JOUR 330, and only one may be taken for credit. See “Cross-Listed Courses” in the catalog.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- SLO1: DESCRIBE BASIC HARDWARE AND SOFTWARE REQUIREMENTS FOR A PERSONAL COMPUTER
  - Identify different hardware required for input, output, processing and storage of data on a personal computer
  - Apply appropriate log on techniques to access lab computers and online course management software
- SLO2: UTILIZE OPERATING SYSTEM TO EFFECTIVELY MANAGE PROGRAMS, FILES AND FOLDERS
  - Demonstrate ability to retrieve, create, copy, move and delete files and folders within a file management hierarchy
  - Locate and launch programs successfully
- SLO3: DIFFERENTIATE BETWEEN, AND APPLY BASIC CONCEPTS FOR BUSINESS APPLICATION SOFTWARE
  - Define and correctly select appropriate program for a given task
  - Demonstrate ability with word processing commands and features such as cursor movement, entering text; formatting including setting margins, line spacing, bold, centering, underlining, changing font typeface and size; inserting clip art; saving, printing, retrieving, and editing a file; spelling checker
Demonstrate ability with spreadsheet commands and features such as cursor movement; entering text, values and formulas; formatting including changing column widths, bold, centering, underlining, changing font typeface and size, formatting numbers with dollar signs; inserting and deleting rows and columns; saving, printing, retrieving, and editing a file; spelling checker

Demonstrate ability with database commands and features such as creating a database, creating tables, creating fields, setting field widths, positioning fields, entering data through tables or forms, designing forms, formatting forms, creating reports, displaying records, changing page orientation, saving, and printing

SLO4: COMMUNICATE, SHARE, AND ACCESS INFORMATION ELECTRONICALLY

Utilize e-mail commands and features to communicate appropriately, sending and receiving messages, including attachments.

Operate search engines, browsers, and related web tools to effectively find information on the World Wide Web

Evaluate web sites for accuracy based on specific criteria

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**CISC 305 Introduction to the Internet**

| Units: | 1 |
| Hours: | 18 hours LEC |
| Prerequisite: | None. |
| Advisory: | CISC 302 or 310 |
| Transferable: | CSU |
| Catalog Date: | June 1, 2019 |

This course is an introduction to how the Internet works and how to effectively use basic Internet services. Topics include browser basics, search engines and search techniques, E-mail, the World Wide Web, Internet security, Internet resources, the Cloud, social networking, and building basic web pages using HTML.

**Student Learning Outcomes**

Upon completion of this course, the student will be able to:

- **SLO 1: IDENTIFY AND ACCESS VARIOUS INFORMATION SOURCES.**
  - describe the structure of the Internet, the Domain Name System, and connectivity options.

- **SLO 2: DISTINGUISH BETWEEN VARIOUS INTERNET SERVICES**
  - distinguish between and use the World Wide Web, a browser, E-mail, FTP, and Social Media services.

- **SLO 3: UTILIZE INTERNET SERVICES AND TECHNOLOGY**
  - download, attach, view, and print files from the Internet.
  - create a personal web page following a predefined format.
CISC 306 Introduction to Web Page Creation

Units: 1
Hours: 18 hours LEC
Prerequisite: CISC 305 with a grade of "C" or better; or equivalent skills for an intermediate level of Internet proficiency to be determined by the instructor of the course.
Transferable: CSU
Catalog Date: June 1, 2019

The student will be able to produce a Web page, including design, layout, construction, and presentation. HTML will be used to format a Web page.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- SLO 1: EXAMINE AND PRACTICE WEB PAGE CREATION.
  - evaluate content needs and apply appropriate design techniques.
  - design a Web page.
- SLO 2: CREATE WEB DOCUMENTS USING CODE.
  - Use XHTML to format Web pages.
  - present a completed Web page.
  - Evaluate design enhancements.

CISC 308 Exploring Computer Environments and the Internet

Units: 1
Hours: 18 hours LEC
Prerequisite: None.
Transferable: CSU
Catalog Date: June 1, 2019

The course acquaints the student with the fundamentals of microcomputer hardware, software and computer networking, focusing on widely used hardware and operating systems, Intel-based PCs and the Windows operating system. The fundamentals of the Internet and Internet tools are introduced, as well as effective electronic communication.
Upon completion of this course, the student will be able to:

- **SLO #1: DIFFERENTIATE AND APPLY BASIC CONCEPTS OF OPERATING SYSTEMS AND COMPUTER HARDWARE.**
  - Explain how computers work, as well as the functions of basic computer components.
  - Design a customized computer system utilizing the control panel and other accessories.
  - Use appropriate commands to capture and print screens.
  - List and discuss basic operating system and Internet terminology and concepts.

- **SLO #2: ORGANIZE COMPUTER FILES AND FOLDERS.**
  - Manage files by utilizing effective procedures for creating, modifying, moving, copying, renaming, and deleting files and folders.
  - Utilize effective operating system search techniques to locate files, folders and data stored on various drives using various filenames and wildcards.
  - Utilize all frequently used operating system commands required to store, manage, back-up, access and maintain files stored on either network, hard drives or other external storage devices.

- **SLO #3: RESEARCH AND APPLY INTERNET CONCEPTS AND SEARCH TECHNIQUES.**
  - Choose appropriate settings to control the behavior of web browsers.
  - Demonstrate use of efficient Internet search techniques using search engines and subject directories.
  - Create and manage Favorites, links, and browser home page settings.
  - Identify some of the various security threats from Internet access and which operating system tools could be appropriate protection.
  - Demonstrate effective use of electronic communication techniques.

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CISC 310 Introduction to Computer Information Science

- **Units:** 3
- **Hours:** 54 hours LEC
- **Prerequisite:** None.
- **Transferable:** CSU; UC
- **General Education:** AA/AS Area II(b); AA/AS Area III(b)
- **C-ID:** C-ID BUS 140; C-ID ITIS 120
- **Catalog Date:** June 1, 2019
This course examines information systems and their role in business, including database management systems, networking, e-commerce, ethics and security, and system infrastructure. Student will apply these concepts and related methods through hands-on projects to develop computer-based solutions to business problems.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- **UNDERSTAND EXISTING AND EMERGING TECHNOLOGIES AND THEIR IMPACT ON ORGANIZATIONS AND SOCIETY.** (SLO#1).
  - explain how a computer system works.
  - distinguish the various hardware and software components of a computer system.
  - differentiate between the most commonly used computer operating systems.
  - differentiate between system software and application software.
  - assess the differences between each of the categories of system and application software.
  - evaluate the social issues pertaining to computer technology including ethics, copyright, privacy and security.
- **DEMONSTRATE AN UNDERSTANDING OF THE DEVELOPMENT AND USE OF INFORMATION SYSTEMS IN BUSINESS** (SLO#2).
  - differentiate between various computer network types and scopes.
  - demonstrate the secure utilization of Internet resources.
  - demonstrate use of cloud-based applications and cloud-based file storage.
  - recommend methods for accessing business information systems.
  - discuss and relate the phases of the System Development Life Cycle.
  - compare various digital media file types.
  - propose methods for securing business information systems.
- **SOLVE COMMON BUSINESS PROBLEMS USING APPROPRIATE INFORMATION TECHNOLOGY APPLICATIONS AND SYSTEMS** (SLO#3).
  - construct solutions to common business problems using electronic spreadsheets.
  - manipulate databases using database software.
  - build software solutions to business problems using internet technologies.
This course introduces the Linux operating system for desktop computers. Concepts include kernels, file structures, Daemons, shells, GUIs, procedures for installing software, creation of user accounts, shell commands, scripts, and file security.

Upon completion of this course, the student will be able to:

- **SLO #01: ANALYZE THE FUNDAMENTALS OF AN OPERATING SYSTEM.**
- Demonstrate use of basic Linux commands and editing, disk, file, and printer management feature.
- Compare Linux with other operating systems.
- **SLO #02: EVALUATE SERVER HARDWARE.**
- Analyze hard disk and memory management.
- Compare physical and logical drives and describe their functionality.
- **SLO #03: ASSESS COMMON APPLICATIONS, PROTOCOLS, MEDIA AND SOFTWARE.**
- Analyze the relationship of the operating system to other applications programs.
- Evaluate and formulate various command lines with correct syntax.

CISC 324 Intermediate Linux Operating System

Upon completion of this course, the student will be able to:

- CISC 324 with a grade of "C" or better
- CSU
- June 1, 2019

This course covers the Linux operating system for desktop computers. It covers advanced shell scripting, C Shell, K Shell, and BASH. Other topics covered in this course include decision-making logic, looping, and nesting. Consult the class schedule for specific operating system offered.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- **SLO #01: ANALYZE THE FUNDAMENTALS OF AN OPERATING SYSTEM.**
- Demonstrate use of basic Linux commands and editing, disk, file, and printer management feature.
- Compare Linux with other operating systems.
- **SLO #02: EVALUATE SERVER HARDWARE.**
- Analyze hard disk and memory management.
- Compare physical and logical drives and describe their functionality.
- **SLO #03: ASSESS COMMON APPLICATIONS, PROTOCOLS, MEDIA AND SOFTWARE.**
- Analyze the relationship of the operating system to other applications programs.
- Evaluate and formulate various command lines with correct syntax.
• SLO #01: EVALUATE AND CONTRAST DIFFERENT SERVER CONFIGURATIONS.
  • Identify network operating system characteristics and versions.
  • Apply Linux system concepts to install advanced Linux feature sets.
  • Identify and verify the availability of system resources.
  • Examine network operating system hardware requirements.
  • Evaluate different network operating system installations and upgrades techniques.
• SLO #02: DIFFERENTIATE THE USE OF COMMON SHELL PROGRAMMING ENVIRONMENTS AND APPLICATIONS.
  • Implement decision making logic in scripts.
  • Create, analyze, and evaluate advanced script files.
  • Compare C shell, K shell, and BASH.
  • Implement looping and nesting in a script.
  • Describe the function of monitoring processes.
• SLO #03: DISTINGUISH BETWEEN THE VARIOUS INSTALLATION METHODS.
  • Examine network operating system hardware requirements.
  • Identify characteristics of the IDE interface and configure IDE devices.
  • Assess and identify the reason the cause for failed installations.
• SLO #04: EVALUATE METHODS TO MANAGE DISKS, FILE SYSTEMS, AND PERIPHERAL DEVICES.
  • Investigate, configure, and troubleshoot volumes and disks.
  • Design and configure removable media, such as tape devices, DVD and CD-ROM devices.
  • Manage, configure, and troubleshoot input and output (I/O) devices.
• SLO #05: MANAGE USERS AND GROUPS.
  • Manage user account properties.
  • Manage and troubleshoot user permissions.
  • Manage user and group rights.

CISC 356 Introduction to Local Area Networks
From hubs to servers this course will introduce students to the exciting field of computer networking. Beginners will become comfortable with the concepts and vocabulary of computer networking and will gain hands-on experience in basic networking technology. Some topics include the Internet and its tools; the diversity of Network Operating Systems one can use in a Local Area Network; how to configure communication protocols, such as TCP/IP; the distinction between a Local Area Network and a Wide Area Network; and the fundamentals of network architecture and design.

### Student Learning Outcomes

Upon completion of this course, the student will be able to:

- **EXPLAIN AND CONFIGURE BASIC FUNCTIONS AND PROPERTIES OF NETWORK OPERATING SYSTEMS FOUND ON TYPICAL LOCAL AREA NETWORKS (LANS) (SLO #01).**
  - Explain the fundamentals of network operating systems.
  - Describe the basic steps of network operating system installation.
  - Configure network services.

- **DIFFERENTIATE BETWEEN CLIENT/SERVER AND CENTRALIZED NETWORKING ENVIRONMENTS (SLO #02).**
  - Discuss the differences between centralized and client/server computing.
  - Identify and configure the functions of clients, servers and other networking equipment that make up a typical LAN.
  - Explain how to implement a network environment with diverse operating systems.
  - Discuss the basics of cloud computing.

- **ASSESS BASIC NETWORK SECURITY REQUIREMENTS AND IMPLEMENT BASIC NETWORK SECURITY TOOLS (SLO #03).**
  - Develop a network security policy.
  - Assess the physical security of network equipment.
  - Understand network data security.

- **DEMONSTRATE AND TEST BASIC LAN ADMINISTRATION AND SUPPORT TASKS (SLO #04).**
  - Manage network accounts.
  - Monitor network performance.
  - Protect network servers from data loss.

- **DISCUSS VARIOUS METHODS FOR CONNECTING LANS TO WIDE AREA NETWORKS (WANS) (SLO #05).**
  - Discuss the technologies used in connecting LANs to WANs.
• Explain some of the terminology used in implementing WANs.
• Configure and describe remote access protocols.
• EXPLAIN AND DEMONSTRATE DIFFERENT APPROACHES TO NETWORK PLANNING AND TROUBLESHOOTING (SLO #06).
• Describe the benefits of network management and planning.
• Explain different approaches to network troubleshooting.
• Explain the types of specialized equipment and other resources for troubleshooting.
• Describe basic measures to take in common troubleshooting situations.

CISC 360 Information & Communication Technology Essentials (A+)

| Units: | 4 |
| Hours: | 54 hours LEC; 54 hours LAB |
| Prerequisite: | None. |
| Advisory: | CISC 302 and 310 |
| Transferable: | CSU |
| Catalog Date: | June 1, 2019 |

This course provides an introduction to the computer hardware and software skills needed to help meet the growing demand for entry-level ICT professionals. The fundamentals of computer hardware and software, as well as advanced concepts such as security, networking, and the responsibilities of an ICT professional, will be introduced. This course helps to prepare students for the CompTIA A+ certification exam.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

• ASSEMBLE HARDWARE AND SOFTWARE COMPONENTS BASED ON CUSTOMER REQUIREMENTS (SLO #01).
• distinguish the various hardware and software components of a computer system.
• identify different hardware required for input, output, processing and storage of data on a personal computer.
• discuss and relate the phases of the System Development Life Cycle.
• OPERATE PERSONAL COMPUTERS, DEVICES, AND SOFTWARE FOR END USERS (SLO #02).
• define and correctly select an appropriate program for a given task.
• use the commands and features of office application software.
• use e-mail commands and features to send and receive messages, including attachments.
• demonstrate effective file management techniques.
• differentiate between various digital media file types.
• locate and launch programs successfully.
• differentiate between the most commonly used computer operating systems.
• differentiate between system software and application software.
• DEMONSTRATE BASIC DATA NETWORKING AND SECURITY/FORENSICS TECHNIQUES (SLO #03).
• differentiate between various computer network types and scopes.
• install and configure network adapters for effective operation on various networks.
• DEMONSTRATE BASIC VIRTUALIZATION, DESKTOP IMAGING, AND DEPLOYMENT OPERATIONS (SLO #04).
• prepare various operating system installation and deployment activities.
• install and configure operating systems in virtual environment.
• PROPERLY AND SAFELY DIAGNOSE, RESOLVE AND RECORD COMMON HARDWARE AND SOFTWARE ISSUES WHILE APPLYING TROUBLESHOOTING SKILLS (SLO #05).
• demonstrate effective troubleshooting techniques.
• operate search engines, browsers, and related web tools to effectively find information on the World Wide Web.
• demonstrate the secure utilization of Internet resources.
• PRACTICE APPROPRIATE CUSTOMER SUPPORT TECHNIQUES (SLO #06).
• demonstrate knowledge of the changing workplace, the work-site team and environment, and ethical behavior.
• analyze customer concerns effectively.
• address customer concerns appropriately and timely.

CISC 495 Independent Studies in Computer Information Science - Core

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<thead>
<tr>
<th>Units:</th>
<th>1 - 3</th>
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</thead>
<tbody>
<tr>
<td>Hours:</td>
<td>54 - 162 hours LAB</td>
</tr>
<tr>
<td>Prerequisite:</td>
<td>None.</td>
</tr>
<tr>
<td>Transferable:</td>
<td>CSU</td>
</tr>
<tr>
<td>Catalog Date:</td>
<td>June 1, 2019</td>
</tr>
</tbody>
</table>

An independent studies project involves an individual student or small group of students in study, research, or activities beyond the scope of regularly offered courses. See the current catalog section of "Special Studies" for full details of Independent Studies.
Upon completion of this course, the student will be able to:

- SLO #1: Actively engage in intellectual inquiry beyond that required in order to pass a course of study (College Wide Learning Outcome – Area 4).
- Discuss and outline a proposal of study (that can be accomplished within one semester term) with a supervising instructor qualified within the discipline.
- Design an independent study (to be completed individually or by collaboration of a small group) to foster special knowledge, skills, and experience that are not available in any one regularly scheduled course.
- Use information resources to gather discipline-specific information.
- SLO #2: Utilize modes of analysis and critical thinking to apply theoretical perspectives and/or concepts in the major discipline of study to significant problems and/or educational activities (College Wide Learning Outcome – Area 3).
- Analyze and apply the knowledge, skills and experience that are involved in the independent study to theoretical perspectives and/or concepts in the major discipline of study.
- Explain the importance of the major discipline of study in the broader picture of society.
- SLO #3: Communicate a complex understanding of content matter of the major discipline of study (College Wide Outcome – Area 3).
- Demonstrate competence in the skills essential to mastery of the major discipline of study that are necessary to accomplish the independent study.
- SLO #4: Identify personal goals and pursue these goals effectively (College Wide Outcome – Area 4).
- Utilize skills from the “academic tool kit” including time management, study skills, etc., to accomplish the independent study within one semester term.
This course provides students with opportunities to develop marketable skills in preparation for employment in their major field of study or advancement within their career. It is designed for students interested in work experience and/or internships in transfer level degree occupational programs. Course content includes understanding the application of education to the workforce; completion of required forms which document the student's progress and hours spent at the work site; and developing workplace skills and competencies. Appropriate level learning objectives are established by the student and the employer. During the semester, the student is required to participate in a weekly orientation and 75 hours of related paid work experience, or 60 hours of unpaid work experience for one unit. An additional 75 or 60 hours of related work experience is required for each additional unit. Work Experience may be taken for a total of 16 units when there are new or expanded learning objectives. Only one Work Experience course may be taken per semester.

### Student Learning Outcomes

Upon completion of this course, the student will be able to:

- **DEMONSTRATE AN UNDERSTANDING AND APPLICATION OF PROFESSIONAL WORKPLACE BEHAVIOR IN A FIELD OF STUDY RELATED ONE'S CAREER. (SLO 1)**
  - Understand the effects time, stress, and organizational management have on performance.
  - Demonstrate an understanding of consistently practicing ethics and confidentiality in a workplace.
  - Examine the career/life planning process and relate its relevancy to the student.
  - Demonstrate an understanding of basic communication tools and their appropriate use.
  - Demonstrate an understanding of workplace etiquette.

- **DESCRIBE THE CAREER/LIFE PLANNING PROCESS AND RELATE ITS RELEVANCY TO ONE'S CAREER. (SLO 2)**
  - Link personal goals to long term achievement.
  - Display an understanding of creating a professional first impression.
  - Understand how networking is a powerful job search tool.
  - Understand necessary elements of a résumé.
  - Understand the importance of interview preparation.
  - Identify how continual learning increases career success.

- **DEMONSTRATE APPLICATION OF INDUSTRY KNOWLEDGE AND THEORETICAL CONCEPTS AS WRITTEN IN LEARNING OBJECTIVES IN PARTNERSHIP WITH THE EMPLOYER WORK SITE SUPERVISOR. (SLO 3)**
CISN 300 Network Systems Administration

This course will provide a student with the knowledge and skills required to build, maintain, troubleshoot and support server hardware and software technologies. The student will be able to identify environmental issues; understand and comply with disaster recovery and physical/software security procedures; become familiar with industry terminology and concepts; understand server roles/specializations and interaction within the overall computing environment. Consult the class schedule for specific operating system offered.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- SLO #01: EXAMINE SERVER FUNDAMENTALS
  - Differentiate between peer-to-peer and client-server networking models
  - Investigate server functions and benefits

- SLO #02: IDENTIFY THE HARDWARE COMPONENTS OF A SERVER
  - Identify characteristics that distinguish server hardware from client hardware
  - Rank user demands on a server
  - Optimize server placement

- SLO #03: EVALUATE SERVER HARDWARE
  - Evaluate motherboard buses
  - Inspect common server processors, and common types of memory
  - Contrast how clock frequency affects performance
  - Compare physical and logical drives and describe their functionality
  - Identify characteristics of the IDE interface and configure IDE cabling and connectors

- SLO #04: DESCRIBE THE FEATURES OF SERVER SOFTWARE
  - Calculate, adequately test and pilot the server upgrade
CISN 301 Network Client Systems Administration

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<tr>
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<td>CISC 302, 308, or 310</td>
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<td>CSU</td>
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<td>Catalog Date:</td>
<td>June 1, 2019</td>
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</table>

This course covers the administration of a client in a client/server network. Topics include designing a basic network, installing and configuring a client network operating system, managing network security with user and group accounts, creating directory structures and network shares, setting up and managing network printers, backing up servers, monitoring and troubleshooting network resources, and establishing policies and procedures for network operations.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- Verify the availability of system resources
- SLO #05: ASSESS COMMON NETWORKING PROTOCOLS, TOPOLOGIES, MEDIA AND EQUIPMENT
  - Examine bus, ring, and star network topologies
  - Describe Token Ring and Ethernet media access methods
  - Uncover the purpose behind bridges, switches, hubs, and routers
  - Discuss NetBEUI, IPX/SPX, and TCP/IP protocols
- SLO #06: CONTRAST DIFFERENT SERVER SOFTWARE
  - Identify network operating system characteristics and versions
  - Examine network operating system hardware requirements
  - Judge different network operating system installations and upgrades techniques
  - Configure, install, and maintain a Linux, and/or Windows network operating system
- SLO #07: DIFFERENTIATE THE USE OF COMMON NETWORK SERVICES AND APPLICATIONS
  - Identify and understand major network operating system services
  - Discuss the different ways that servers run network applications
  - Describe the function of monitoring agents
  - Specify the functions of the server as a network device
SLO #01: DEDUCE THE DIFFERENCE BETWEEN A NETWORK CLIENT OPERATING SYSTEM AND A NETWORK SERVER OPERATING SYSTEM

- Evaluate client operating system support features
- Identify the role of a network client operating system in the enterprise

SLO #02: DISTINGUISH BETWEEN THE VARIOUS INSTALLATION METHODS

- Assess the needs to upgrade from a previous operating system version
- Measure ways to migrate existing user environments to a new installation
- Inspect post-installation updates and product activation
- Reason the cause for failed installations

SLO #03: EVALUATE METHODS TO MANAGE DISKS, FILE SYSTEMS, AND PERIPHERALS DEVICES

- Investigate, configure, and troubleshoot volumes and disks
- Design and configure removable media, such as tape devices, DVD and CD-ROM devices
- Manage, configure, and troubleshoot input and output (I/O) devices
- Manage printers and fax devices
- Manage print jobs

SLO #04: MANAGE AND CONFIGURE THE USER'S EXPERIENCE

- Choose accessibility settings
- Manage desktop components
- Manage display options
- Choose regional and language settings
- Manage users’ profiles and data

SLO #05: MANAGE APPLICATIONS

- Manage distribution of applications
- Investigate, and troubleshoot application compatibility with the network client operating system
- Manage and configure a web browser

SLO #06: DISCOVER HOW TO CONNECT A NETWORK CLIENT OPERATING SYSTEM TO A NETWORK

- Investigate how to configure a wireless network
- Assess how to connect to a virtual private network (VPN)
- Manage and configure Remote Desktop and Remote Assistance
- Configure and troubleshoot the TCP/IP protocol

SLO #07: MANAGE USERS AND GROUPS

- Manage user account properties
CISN 302 Intermediate Network Systems Administration

Units: 3
Hours: 45 hours LEC; 27 hours LAB
Prerequisite: CISN 300 with a grade of "C" or better
Transferable: CSU
Catalog Date: June 1, 2019

This course covers advanced administrative tasks of a server in a client/server network. Topics include configuring the server environment, implementing system policies, implementing and managing fault-tolerant disk volumes, managing applications, installing and managing connectivity for different network and client operating systems, managing remote servers, implementing directory replication and file synchronization, and troubleshooting advanced network problems.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- **SLO #01: EXAMINE NETWORK SERVICES**
  - Measure the purpose of the Dynamic Host Configuration Protocol (DHCP) and how it streamlines network administration
  - Evaluate the process of name resolution (DNS) and why it is important to an organization
  - Set up a File Server

- **SLO #02: DESIGN NETWORK SECURITY**
  - Rate the network security protocols used for authorization
  - Research the basics of a security model
  - Examine user rights and understand the difference between a user right and a permission
CISN 303 Network Administration - Linux Server

3 Units: 45 hours LEC; 27 hours LAB

Prerequisite: CISN 300 with a grade of "C" or better

Transferable: CSU

Catalog Date: June 1, 2019

This course provides introductory coverage of Linux Network Administration. The course maps to the CompTIA Linux+ certification exam, and to SAIR/GNU's Linux Networking course. Specific course topic coverage includes: introducing Linux; exploring the desktop; using the Shell; understanding users and file systems; understanding text processing; managing processes; using network clients; installing Linux; understanding system initialization; managing software packages and file systems; managing users; configuring networks; system and kernel management; writing Shell scripts; and advanced topics and troubleshooting. The course requires many hands-on projects, which allow students to practice what they learn.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- SLO #01: EXAMINE THE BASIC FEATURES OF THE LINUX OPERATING SYSTEM IN COMPARISON TO OTHER OPERATING SYSTEMS
- Describe how Linux was created and how it compares to other operating systems
- Outline the skills required and challenges facing a system administrator
• Distinguish between the graphical system used by Linux and command line
• Support the basic features of the GNOME and KDE desktop interfaces
• SLO #02: UTILIZE THE SHELL AND EVALUATE ITS FUNCTIONALITY
• Manipulate variables in the shell to control the working environment
• Formulate data at the command-line and for print files
• Manipulate text using the vi editor
• Create and manage user and group accounts
• Construct access permissions on files and directories
• SLO #03: COMPARE AND CONTRAST DIFFERENT LINUX NETWORK TOOLS
• Demonstrate how to log in to a Linux system over a network connection. Describe how it is different from a Windows network connection.
• Select the appropriate command-line tools for common network services such as FTP and the Web
• Illustrate the difference between network interfaces using command-line and graphical utilities
• Apply the skill necessary to set up a simple DHCP server, and manage networked printing services
• SLO #04: ANALYZE AND ARTICULATE THE BASIC STEPS OF A LINUX SOFTWARE INSTALLATION
• Analyze the hardware components of your computer system
• Design a hard disk space to hold a new Linux installation
• Describe the steps that hardware starts a standard PC operating system
• Explain the difference between the LILO and GRUB boot loader
• Create the init program and the scripts used to start system services
• Manage system services after start-up

CISN 304 Networking Technologies

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<td>June 1, 2019</td>
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This course introduces the architecture, structure, functions, components, and models of the Internet and other computer networks. The principles and structure of IP (Internet Protocol) addressing and the fundamentals of Ethernet concepts, media, and operations are introduced to provide a foundation for further study of computer networks. It uses the OSI (Open Systems Interconnection) and TCP (Transmission Control Protocol) layered models to examine the nature and roles of protocols and services at the application, network, data link, and physical layers. Preparation for the CompTIA Network+ certification exam.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- IDENTIFY THE PURPOSE AND FUNCTION OF THE MOST WIDELY USED PROTOCOLS (SLO #01).
- List the services provided by network protocols.
- Describe how protocols enable networked computers to communicate.
- IDENTIFY THE LAYERS OF THE OSI MODEL (SLO #02).
- Describe the functions associated with each of the OSI model layers.
- LIST THE CABLING TOPOLOGIES USED TO BUILD LOCAL AREA NETWORKS (SLO #03).
- Name the types of cables used to build LANs.
- List the grading systems used for the various cable types.
- Describe how to install cables externally, secure them in place, and run them around common obstacles.
- Explain the steps involved in an internal cable installation.
- Describe the wiring of a crossover cable.
- DESCRIBE THE FUNCTION OF TYPICAL NETWORKING HARDWARE (SLO #04).
- Associate the importance of the troubleshooting process with a network interface adapter.
- Describe the difference between a hub, switch and a router. Understand the functions of each.
- LIST THE ETHERNET PHYSICAL LAYER STANDARDS (SLO #05).
- Describe the functions of the Ethernet frame.
- List the physical layer options for Token Ring networks.
- Distinguish between the various types of FDDI network connections.
- DESCRIBE THE FUNCTIONS OF THE INTERNET PROTOCOL (IP) PROTOCOL AND THE VARIOUS IP HEADER FIELDS (SLO #06).
- Summarize the basics of IP addressing, routing, and fragmentation.
- Describe the functions of the Internetwork Packet Exchange (IPX) protocol and the various IPX header fields.
- List the function of the Address Resolution Protocol (ARP).
- Describe the functions of the Internet Control Message Protocol (ICMP).
- Describe the properties of TCP/IP’s application layer protocols.
• IDENTIFY THE FUNCTIONS OF A ROUTER AND DESCRIBE THE INFORMATION IN A ROUTING TABLE (SLO #07).
• Distinguish between static and dynamic routing.
• Create a static route in a routing table.
• Explain the operation of routing protocols.
• IDENTIFY HOW TO CONFIGURE TCP/IP CLIENT PARAMETERS ON AN OPERATING SYSTEM (SLO #08).
• Describe the basic networking capabilities of the Windows, Novell NetWare, UNIX/Linux, and Apple Macintosh operating systems.
• Describe the client capabilities of the major operating systems.
• Identify the directory services provided with major operating systems.
• Explain how Dynamic Host Configuration Protocol (DHCP) assigns TCP/IP configuration settings to workstations.
• SUMMARIZE THE MECHANISMS USED TO MAKE NETWORK DATA CONTINUOUSLY AVAILABLE (SLO #09).
• Describe how clustering ensures the constant availability of vital network servers.
• Report how to use redundant equipment to provide fault-tolerant network communications.
• Describe the types of hardware used to perform backups.
• Outline the capabilities of software backup products.
• Distinguish among full, incremental, and differential backups.
• DESCRIBE THE TYPES OF TECHNOLOGIES USED TO CONNECT REMOTE COMPUTERS TO NETWORKS (SLO #10).
• Describe the characteristics of a leased line.
• Express how frame relay provides flexible wide area networks (WAN).
• Describe the characteristics of the Asynchronous Transfer Mode (ATM) protocol.
• Describe the Serial Line Internet Protocol (SLIP) and Point-to-Point Protocol (PPP) frame formats.
• LIST THE TOOLS USED TO MONITOR SYSTEM AND NETWORK PERFORMANCE IN THE MAJOR NETWORK OPERATING SYSTEMS (SLO #11).
• Describe the troubleshooting functions of crossover cables and loopback connectors.
• List the capabilities of more elaborate cable testing equipment.
• Describe the process of isolating the source of a network problem.
• Distinguish among network problems, computer problems, and user problems.
Students will learn to install, configure, and administer Microsoft Windows Active Directory services. The course also focuses on implementing Group Policy and understanding the Group Policy tasks required to centrally manage users and computers. Students will use Group Policies to configure and manage the user desktop environment, to configure and manage software, and implement and manage security settings. Students will install and manage Windows Domains and Domain Controllers through Active Directory.

### Student Learning Outcomes

Upon completion of this course, the student will be able to:

- **SLO #01: UNCOVER KEY NETWORK ARCHITECTURES, TOPOLOGIES, INTERDEPENDENCIES AND CONSTRAINTS**
  - Conceive the key sources of information with respect to architecture and topology
  - Design sample networking and operating environments
  - Examine various network architecture, topology, hardware and software
  - Set up and use Microsoft Windows Active Directory
  - Set up and use Domain Name System (DNS) to support an installation of Active Directory

- **SLO #02: PREPARE OVERALL DESIGN AND INTEGRATION PLAN FOR IMPLEMENTING AN ACTIVE DIRECTORY INFRASTRUCTURE**
  - Analyze and collect information about a network
  - Analyze situations and information and formulate a plan of action that is in line with business and financial constraints
  - Create and manage Trees and Forests in a Windows environment
  - Analyze the needs of a network and suggest modifications to technological systems
  - Analyze the needs of a network and recommend tradeoffs when necessary

- **SLO #03: PERFORM SERVER AND SYSTEM CONFIGURATION AND SOFTWARE LOADING**
  - Analyze and correct operational problems with a Windows Domain Controller promotion
  - Implement new applications available with Windows Advanced Server
  - Manage software with Group Policies
  - Manage user environments, scripts, redirect user folders, and troubleshoot user environment management with Group Policies

- **SLO #04: SET UP AND MAINTAIN USER ACCOUNTS**
  - Examine the purpose of user accounts and the requirements for new user accounts
CISN 341 CISCO Networking Academy (CCNA)™: Networking Theory and Routing Technologies

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This course covers networking theory and routing technologies, including the OSI Model, beginning router configurations, and routed and routing protocols. It prepares students for the CISCO Certified Network Associate (CCNA) certification examination. It also continues and expands the study of binary, decimal, and hexadecimal numbering systems to change variable length sub-net mass.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- TROUBLESHOOT AND SOLVE ROUTING PROBLEMS WITHIN A ROUTING DOMAIN (SLO 1).
• Understand and describe the purpose, nature, and operations of a router, routing tables, and the route lookup process, dynamic routing protocols, distance vector routing protocols, and link-state routing protocols, the purpose and types of access control lists (ACLs), and the operations and benefits of Dynamic Host Configuration Protocol (DHCP), Domain Name System (DNS) for IPv4 and IPv6, and Network Address Translation (NAT).

• CONFIGURE AND TROUBLESHOOT BASIC OPERATIONS OF A SMALL SWITCHED NETWORK (SLO 2).

• Configure and verify static routing and default routing; configure and troubleshoot basic operations of routers in a small routed network including Routing Information Protocol (RIPv1 and RIPv2) and Open Shortest Path First (OSPF) protocol (single-area OSPF); Configure, monitor, and troubleshoot ACLs for IPv4 and IPv6; and configure and troubleshoot NAT operations.

• CONFIGURE AND TROUBLESHOOT VLANS IN A SMALL SWITCHED NETWORK (SLO 3).

• Describe basic switching concepts, how VLANs create logically separate networks and how routing occurs between them, and enhanced switching technologies such as VLANs, VLAN Trunking Protocol (VTP), Rapid Spanning Tree Protocol (RSTP), Per VLAN Spanning Tree Protocol (PVSTP), and 802.1q.

• Configure and troubleshoot basic operations of a small switched network, VLANs, and inter-VLAN routing.

CISN 374 Messaging Server Administration

| Units: | 3 |
| Hours: | 45 hours LEC; 27 hours LAB |
| Prerequisite: | CISN 302 with a grade of "C" or better |
| Transferable: | CSU |
| Catalog Date: | June 1, 2019 |

This course provides students with the knowledge and skills required to deploy and administer/support Microsoft Exchange Server. This course covers use of Exchange Server to create and manage recipient objects; maintain an existing Exchange Server organization, as well as design and implement a new organization; create and manage public folders; perform basic backup procedures; monitor server performance and configure link monitors between connected sites; and manage electronic forms in an organization. The student will also create and configure the various messaging connectors; configure directory and public folders replication; and configure Exchange Server for connectivity to the Internet. The course also examines how Exchange Server provides for connectivity to other messaging systems.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

• SLO #01: CONFIGURE, INSTALL AND TROUBLESHOOT MESSENGER SERVER

• Analyze the purpose of Active Directory

• Investigate the different Active Directory elements

• Install and configure messaging server software for clients and message recipients
• Explore Exchange Server, protocols and services integration

• SLO #02: MANAGE, MONITOR, AND TROUBLESHOOT BACK-END AND FRONT-END EXCHANGE SERVER 2003 SERVERS
  • Plan for post implementation configuration
  • Choose an administrative model
  • Plan administrative groups
  • Plan operation mode—switch to native mode whenever possible
  • Plan server configuration—decide whether to use front-end and back-end
  • Plan for firewall configuration
  • Manage clusters and front-end and back-end servers

• SLO #03: MANAGE AND TROUBLESHOOT PUBLIC FOLDERS AND VIRTUAL SERVERS
  • Comprehend the functions and benefits of public folders
  • Create public folders
  • Set up a default public folder tree and general-purpose public folder trees
  • Set up for public folder administration and security
  • Identify the importance of proper authentication and encryption

• SLO #04: MONITOR, MANAGE, AND TROUBLESHOOT DATA STORAGE AND BACKUP AND RECOVERY
  • Manage data storage by using storage groups
  • Identify the benefits and detriments of the different disk arrays and storage technologies
  • Identify the importance of backing up and restoring a server
  • Analyze how to restoring mailboxes
  • Plan on backing up and restoring system state data

• SLO #05: MANAGE, MONITOR, AND TROUBLESHOOT SERVER HEALTH AND INFRASTRUCTURE PROBLEMS
  • Manage the daily logs; services and resources, server statistics; the Event Viewer; and the Queue Viewer
  • Manage the scheduled reports; the protocol logs, the OWA servers, mailbox limits, the Badmail folder; and the postmaster mailbox
  • Manage the database defragmentation
  • Verify server integrity
  • Monitor the network, and server operations
  • Monitor firewalls, permissions, encryption, and digital signatures
  • Monitor services, such as ARP, DNS, Active Directory, and network connectivity
CISN 378 Database Administration for Microsoft SQL Server

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<td>Prerequisite:</td>
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This course provides students with the knowledge and technical skills required to install, configure, administer, and troubleshoot the client/server database management system of Microsoft SQL Server. The student will also learn to manage files and databases; choose and configure a login security method; plan and implement database permissions; secure SQL Server in an enterprise network; perform and automate administrative tasks; create custom administrative tools; monitor and optimize SQL Server performance; and replicate data from one SQL Server to another.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- **SLO #01: DEVELOP AND IMPLEMENT INSTALLATION OF SQL SERVER**
  - Research the hardware and software requirements for Microsoft SQL Server and the SQL Server management tools
  - Deduce the various SQL Server Editions and the selection criteria for choosing each
  - Deduce the upgrade process for an installed SQL Server
  - Analyze the different licensing modes
  - Verify the proper software installation options that are appropriate for your environment

- **SLO #02: SET UP AND USE PROPER ADMINISTRATIVE PROCEDURES**
  - Manage the tools and Transact-SQL statements used to create and modify a database
  - Identify and perform common SQL Server configuration tasks
  - Identify and perform routine database administration tasks
  - Identify and automate routine maintenance tasks by creating and scheduling jobs
  - Create alerts and operators
  - Identify and use administrative jobs in a multi-server environment
  - Analyze a strategy for maintaining the high-availability of SQL Server

- **SLO #03: ANALYZE AND IMPLEMENT SECURITY PROCEDURES**
  - Identify basic security concepts including system, end-user and operational security
  - Infer the difference between Microsoft's Windows Authentication Mode and Mixed Authentication Mode
  - Manage SQL Server security in the enterprise environment
  - Assign login accounts to database user accounts and roles
• Assign permissions to user accounts and roles
• Manage security with views and stored procedures
• Create and use application roles to manage application security
• SLO #04: ANALYZE THE DIFFERENT WAYS TO TRANSFER DATA
  • Reason the process of, importing, exporting, and transforming data
  • Identify and use the tools for importing and exporting data in Microsoft SQL Server
• Create a DTS package to transform and import and export data using Data Transformation Services (DTS)
• SLO #05: ANALYZE THE DIFFERENT WAYS TO DISTRIBUTE DATA
  • Identify the various methods to distribute data and the criteria for using each
  • Discover how each of the SQL Server replication agents are used
  • Discover the different SQL Server replication types and the business reasons for using each
  • Discover the different physical replication models and the topology in which each model would be used
• SLO #06: PERFORM SYSTEM BACKUPS AND RESTORE DATA
  • Manage a system backup and restoration procedure
  • Set up a backup for either a user or a system databases by using Transact-SQL statements and SQL Server Enterprise Manager
  • Set up a restore for either a user or a system databases by using Transact-SQL statements and SQL Server Enterprise Manager
  • Identify system problems and correct them, if necessary
• SLO #07: CREATE AND PRESENT REPORTS
  • Analyze and synthesize information
  • Analyze and identify networking improvements
  • Create reports using word processing and other presentation software
  • Create and present well-organized reports to a variety of audiences

CISN 490 Networking Helpdesk Practicum

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<td>CISC 360, CISN 300, and CISN 304 with grades of &quot;C&quot; or better</td>
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<td>CSU</td>
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This course focuses on key information and skills for user support professionals, including troubleshooting and problem solving, successful communication with users, determining a client's specific needs, and training end users. For those considering entering the field, alternate career paths for user-support workers are covered. With balanced coverage of both people skills and technical skills, this course is an excellent resource for those in or preparing for the technical-support field. Students are required to support end-users for twenty hours either on or off campus as part of this class.

**Student Learning Outcomes**

Upon completion of this course, the student will be able to:

- **SUMMARIZE THE NEED FOR EFFECTIVE COMPUTER USER SUPPORT (SLO #01).**
  - Define the term end-user computing and briefly describe the developments that led to end-user computing and user support.
  - Describe the characteristics of early computer systems.
  - Describe a microcomputer.
  - Discuss the basic hardware and add-on peripherals that are commonly used.
  - Define the total cost of ownership (TCO).
  - Discuss the different types of user support and names for user support personnel, including help desk, call center, and technical support.

- **DEMONSTRATE EFFECTIVE COMMUNICATION SKILLS (SLO #02).**
  - Define the term customer-service ethic and explain why organizations place so much emphasis on excellent customer service.
  - Discuss strategies for building understanding.
  - Define the term incident management strategy.
  - Categorize the four dimensions of personality measured on the Myers-Briggs Type Indicator (MBTI) personality analysis.
  - Describe a difficult client.

- **REVIEW THE SKILLS FOR TROUBLESHOOTING COMPUTER PROBLEMS (SLO #03).**
  - Define the term troubleshooting and explain that troubleshooting computer problems is an iterative process that does not have a fixed series of steps.
  - Define the term problem solving and explain how problem solving might apply to fixing a malfunctioning printer, for example.
  - Explain how troubleshooters must use decision-making skills to choose between several possible solutions to a problem.
  - Describe the different ways that troubleshooters must use communication skills to get information about the problem and to communicate the solution.
  - Explain that active listening plays an important role in understanding the problem. Paraphrasing can be helpful in making sure the troubleshooter has an accurate picture of what is going on.
Define the term escalation and explain how this approach can help solve a problem that does not yield to more common methods.

Define the term replication and explain how this strategy can help to solve a problem.

Discuss how hardware and software device configuration should be examined for possible fixes.

EXAMINE COMMON SUPPORT PROBLEMS (SLO #04).

Define the term bug and describe the ways in which software vendors repair bugs and add new features using patches, updates, service packs, releases, new versions, and upgrades. Describe how release numbers are used to label software versions.

Explain that performance problems result from poor interaction between hardware and software.

Describe the types of misunderstandings that may cause users to perceive that there is a computer problem.

DESCRIBE THE FUNCTION OF A HELP DESK (SLO #05).

Define the term incident management and the more specific term call management.

Discuss the importance of making sure the user is qualified to receive support.

Describe the manner in which a support agent assigns a priority code to an incident. Explain that the priority code determines the position of the incident in the incident queue.

Review the factors that may cause job stress for support workers.

Describe the importance of the managerial role to help desk support staff.

DEVELOP AND IMPLEMENT TYPICAL PRODUCT SUPPORT STANDARDS (SLO #06).

Examine the resources that can be used to help make product evaluation decisions.

Review the criteria for choosing to upgrade to a newly released product or service.

Discuss the balance between allowing users freedom to choose the best software and hardware for their specific purposes and providing support services for a diverse base of different products.

MEASURE A USER’S NEEDS (SLO #07).

Define the problem clearly.

Identify the roles of stakeholders.

Identify sources of information.

Develop an understanding of the existing system.

Investigate alternatives to the existing system.

Develop a model of the proposed solution.

DEMONSTRATE HOW TO INSTALL AND MANAGE END-USER COMPUTERS (SLO #08).

Review pre-installation site preparation tasks.

Discuss the purpose and contents of a site management notebook.

Define the steps to install and configure hardware, operating systems, networks, and application software.
Analyze ongoing site management tasks.

REVIEW HOW TO TRAIN END-USERS (SLO #09)

Identify the four steps in the training process: planning, preparation, presentation, and progression.

Computer Information Science - Programming (CISP)

CISP 300 Algorithm Design/Problem Solving

| Units: | 3 |
| Hours: | 54 hours LEC |
| Prerequisite: | MATH 120 with a grade of "C" or better, or placement through the assessment process. |
| Transferable: | CSU; UC |
| General Education: | AA/AS Area II(b) |
| Catalog Date: | June 1, 2019 |

This course covers the foundational concepts of computer languages such as C++, SQL, Visual Basic, JavaScript, PHP, and C#. Students will learn what lies underneath desktop, web, mobile, and database applications. Students may petition for GE Area B5 credit after transfer to CSUS.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- **SLO #1: MANAGE DATA INVOLVED IN AN ALGORITHM**
  - Recognize the valid values that can be stored as integer, real, string, and boolean data.
  - Declare variables of the appropriate data type with the smallest scope necessary for the algorithm.
  - Decide whether to represent data as variables, constants, or literals in an algorithm.
  - Combine two values of the same type into a single value using arithmetic operators such as + or MOD, comparison operators such as ! =, and logical operators such as AND.
  - Design statements to get input data from keyboard entry and/or from a text file and store this data into typed variables.
  - Design statements to send output data from variables to a monitor and/or to a text file.
  - Group logically related data of the same type into an indexed array.

- **SLO #2: DESIGN A LOGICALLY AND SYNTACTICALLY CORRECT SEQUENCE OF INSTRUCTIONS TO INPUT DATA, CALCULATE ANSWER(S) FROM INPUT DATA, AND OUTPUT ANSWER(S).**
  - Change the value of variables and constants using assignment statements. Write a function call using an assignment statement.
• Combine two numeric values using arithmetic operators and library math functions. Compare the results of integer and real number division.

• Write pseudocode statements in the correct order to accomplish a task.

• SLO #3: DESIGN DECISION LOGIC STATEMENTS (IFS AND LOOPS) TO CONDITIONALLY EXECUTE PORTIONS OF AN ALGORITHM

• Create Boolean expressions with two same typed values and comparison operators. Combine two or more Boolean expressions using logical operators AND and OR into appropriate logic for an algorithm.

• Identify when to use relational (If) logic in an algorithm. Write appropriate If-Then, If-Then-Else, If-Then-ElseIf-Then-Else statements and nested If statements as required for an algorithm.

• Identify when to use repetition loop logic in an algorithm. Write appropriate While, Do-While, Do-Until, For statements and nested loops as required for an algorithm.

• Design repetition or relational statements to perform validation on input data.

• SLO #4: MODULARIZE AN ALGORITHM INTO SEPARATE SECTIONS

• Write a primary or main module to prompt for and accept input data, calculate a result from this data, and output the result. Any or all of these steps may be performed by separate modules/functions.

• Write module and function calls with the correct number and type of arguments as defined by the module/function header.

• Compare and contrast calls to a module and a function, including the way that returned data is accepted.

• Design modules and functions that use value parameters, reference parameters, local variables, and global constants to perform their task.

• SLO #5: EXPLORE SIMPLE DATA STRUCTURE ALGORITHMS

• Implement bubble, selection, and insertion sorts to organize arrays. Implement binary search to find a particular value within a sorted array.

• Create algorithms to manipulate strings character-by-character using If and loop logic and library functions.

CISP 310 Assembly Language Programming for Microcomputers

| Units: | 4 |
| Hours: | 54 hours LEC; 54 hours LAB |
| Prerequisite: | CISP 360 with a grade of "C" or better |
| Transferable: | CSU; UC |
| C-ID: | C-ID COMP 142 |
| Catalog Date: | June 1, 2019 |

This course is an introduction to computer architecture using assembly language programs. Topics include: binary representation of data and instructions, memory addressing modes, subroutines and macros, operating system interrupts, processor architecture, and interfacing with high level languages.
Upon completion of this course, the student will be able to:

- **SLO 1:** RECOGNIZE THE COMPUTER ARCHITECTURE ISSUES NEEDED TO WRITE ASSEMBLY LANGUAGE CODE.
  - Analyze the architecture of a processor and the organization of its memory by discussing such topics as registers, clock speed, busses, and addressing modes.

- **SLO 2:** COMPARE AND CONTRAST THE BINARY REPRESENTATION OF DATA AND ASSEMBLY LANGUAGE INSTRUCTIONS.
  - Analyze the binary representation of data using contextual clues to translate the data into characters, positive or negative integers, positive or negative fractional numbers, or machine instructions.
  - Correlate integer values in different bases (e.g. binary, octal, decimal, and hexadecimal).
  - Correlate the external (monitor) string representation of numbers and their internal (memory) binary format.

- **SLO 3:** CREATE ASSEMBLY LANGUAGE PROGRAMS THAT ACCEPT INPUT, PERFORM CALCULATIONS AND MAKE DECISIONS BASED ON THE INPUT, AND DISPLAY AN ANSWER.
  - Solve memory access problems by using the addressing modes supported by the processor.
  - Solve bit-level problems using AND, OR, NOT, XOR and bit-shifting instructions on binary values.
  - Solve simple calculation issues using arithmetic instructions.
  - Solve keyboard input and display monitor output problems using operating system interrupt calls.
  - Differentiate between the temporary storage of the stack and named memory locations (variables).
  - Compare and contrast subroutines and macros to organize assembly language statements. Create subroutines and macros, both internal and external to the main body of the program.
  - Understand the role of the stack and the instruction pointer register in subroutine execution.

- **SLO 4:** EXPLAIN THE ROLES OF SOFTWARE IN THE CREATION, BUILDING, AND DEBUGGING OF EXECUTABLE FILES USING ASSEMBLY LANGUAGE.
  - Coordinate the use of text editors, compilers, linkers, and debuggers during the creation of assembly language programs.
  - Analyze the memory space (RAM and registers) of an executing program with a debugging tool to trace the execution and determine the correctness of the execution.
  - Explain how memory is allocated for a program during the compilation process.
This is an introductory course in programming databases. Topics include analysis and design, modular programming, screen displays and menus, and multiple databases.

### Student Learning Outcomes

Upon completion of this course, the student will be able to:

- **IDENTIFY THE PURPOSE OF COMMON DATABASE LANGUAGES (SLO# 1)**
- Write, develop and synthesize programs in one of the common database languages.
- Describe the fundamentals of SQL programming language.
- Analyze, comprehend problems for computer applications, as evidenced through program documentation.
- Explain how SQL programming language is used to extract data from the database.
- Assess and utilize common SQL query constructs.
- Distinguish between Data Definition Language (DDL) and Data Manipulation Language (DML).
- List common structure of a database query using SQL.
- Utilize SQL select statements for sorting and grouping data from the database.

- **DEVELOP REPORTS TO DISPLAY DATA EXTRACTED FROM THE DATABASE (SLO# 2)**
- Design and produce small databases, screen displays.
- Organize data to generate reports based on data in the database that conform to user requests.

- **DESCRIBE THE FUNCTION OF VARIOUS JOINS (SLO# 3)**
- Utilize the fundamental vocabulary and constructs of SQL to perform joins on tables in the database.
- Outline the various types of table joins.
- Distinguish among outer and inner joins.

- **ANALYZE AND DEVELOP PL/SQL SCRIPTS (SLO# 4)**
- Create PL/SQL as a programming tool to enable automation of multiple database interaction tasks.
- Develop PL/SQL scripts to meet programming specifications.
- Develop, write, assess and evaluate triggers.
- Analyze PL/SQL script algorithms to achieve desired output.
This course is designed to introduce relational database technology, normalization, entity relationships, logical model design, and ISO-ANSI standard Structured Query Language (SQL). Topics covered include: database design, basic properties of a relational database such as relations, tables, primary keys, foreign keys and principles of normalization, simple SQL select statements, sorting and grouping data, joining tables, subqueries and views. The course covers core concepts in identifying data and information management requirements for organizations, data modeling, and normalization techniques. The database design section focuses on logical model design and entity relationship (ER) modeling. The course exposes students to the use of Relational Database Management Systems using an industrial-strength database management system. Students will leave the course with a good working knowledge of database technology.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- **SLO# 1:** Demonstrate an understanding of basic Relational Database Management System terminology
- Define, compare and contrast database design and tradeoff methodologies, Relational Database Management Systems
- Develop and utilize the fundamental vocabulary and constructs of the SQL.
- **SLO# 2:** Define and understand the concept of joins, sorting and grouping data, joining tables, subqueries and views.
- Construct and implement easy to medium difficulty queries in SQL
- create database objects using Data Definition Language.
- **SLO# 3:** construct subqueries, and joins using Data Query Language.
- demonstrate an understanding of transaction control statements in SQL.
- **SLO# 4:** Demonstrate a basic understanding of logical model design and entity relationship (ER) modeling.
- Explain normalization and entity-relationships in table design
This course builds upon the Introduction to Relational Databases and SQL course with more in-depth SQL constructs common to most commercial database products and extensions to the SQL language. Topics include: complex joins including inner and outer joins, correlated subqueries, complex table definition, table and column constraints, Union, Intersection, Minus, triggers, procedures and packages.

**Student Learning Outcomes**

Upon completion of this course, the student will be able to:

- **SLO# 1**: Design, implement, and demonstrate an understanding of SQL constructs to include data definition language, data manipulation language, and data query language.
- **Design and implement queries for information extraction from databases.**
- **SLO# 2**: Demonstrate use advanced SQL concepts like multiple-table joins, subqueries and logical data extraction.
- **SLO# 3**: Distinguish and utilize the concept of joins, sorting and grouping data, joining tables, subqueries and views.
- **SLO# 4**: Design and implement medium to complex difficulty queries in SQL using procedures, packages and triggers.

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**CISP 353 Application Development in a Client Server Environment**

This course is designed for the intermediate level SQL programmer to design, create and deploy GUI applications that access relational database management systems. Topics include: GUI design fundamentals, data control and access methods (remote and local), creating datasets, implementing joins, transaction processing, multi-user data access, record locking, and deploying and installing applications on client workstations.

**Student Learning Outcomes**
Upon completion of this course, the student will be able to:

- SLO# 1: Design and develop robust Graphical User Interfaces (GUIs).
  - Choose input and output controls to place on the GUI that allow clear communication between the program and the end user, as defined by the current version of Visual Basic.
  - Design GUI behavior to limit user options with the techniques of hiding or disabling controls based on the previous user actions.
  - Ensure that positive user action is required to display the output for each new set of inputs, utilizing the specific technique that depend on the abilities of the current version of Visual Basic.
  - Use common VB.NET Windows controls effectively in an application (for example, TextBox, CheckBox, RadioButton, Label, PictureBox, GroupBox, ListBox, and ComboBox.

- SLO #2: Install a GUI application on a client workstation.
  - Choose input and output controls to place on the GUI that allow clear communication between the program, the end user and the underlying database.
  - Design GUI behavior to limit user options with the techniques of hiding or disabling controls based on the previous user actions.
  - Ensure that positive user action is required to display the output for each new set of inputs.

- SLO #3: Use software to establish connection to database server.
  - Access remote and local data on a database server.

- SLO #4: Develop and implement input data validation.
  - Implement logic that ensures that input data is valid before using the data.
  - Demonstrate the process to hide or disable controls on the GUI and alert the user of an input error for invalid input data.
  - Construct methods to identify user input errors.
  - Access and read input data from a text file.

- SLO #5: Construct MDI applications with menus.
  - Organize related clickable operations into a pull-down or pop-up menu.
  - Design GUI behavior to perform advanced processing options with the techniques of selecting data from the database based on user input.
  - Construct an application that allows users to input select criteria to be passed as parameters to queries.

CISP 354 Introduction to Relational Database Administration
This course is designed to introduce students to administering a relational database management system. Topics include: managing users, privileges, resources, and tablespaces; creating an operational database, managing database files; how to start up and shut down an instance or database, the data dictionary, transaction processing, and backup and recovery issues. Completion will provide students with sufficient knowledge for an entry level Database Administration position in industry.

Upon completion of this course, the student will be able to:

- **DESCRIBE NORMALIZATION OF DATA IN A DATABASE (SLO #01).**
  - Evaluate database model for conformance to various normal forms.
  - Audit the normalization process to the third normal form.
  - Convert database model between 1st, 2nd, and 3rd normal forms.

- **SUMMARIZE THE MECHANISMS USED TO INSTALL A RELATIONAL DATABASE MANAGEMENT SYSTEM(SLO #02).**
  - Classify, install, incorporate, prepare and manage a Relational Database Management System (RDBMS) installation.
  - Demonstrate, simulate outline and sketch start up and shut down of a database.

- **LIST THE TOOLS USED TO MONITOR THE DATABASE FOR TYPICAL USER CONFIGURATION (SLO #03).**
  - Prepare, tabulate, employ and compile typical configurations of client workstations to access the RDBMS.
  - Document common configurations to be deployed across workstations to enable access to the RDBMS.
  - Differentiate between user and administration configurations of the RDBMS.

- **IDENTIFY HOW TO MANAGE USERS WITH ACCESS TO THE RDBMS(SLO #04).**
  - Validate and demonstrate ability to create, modify and remove users, groups and roles.
  - Evaluate existing user roles and manager user permissions.

- **DESCRIBE THE TYPES OF BACKUP METHODOLOGIES USED TO BACKUP DATA IN THE DATABASE(SLO #05).**
  - Formulate, draft and incorporate database backup and recovery procedures.
  - Document database backup plan for review.

- **SUMMARIZE MECHANISMS USED TO MAKE USER ACCESS TOT THE DATABASE CONTINUOUSLY AVAILABLE (SLO #06).**
Define, Plan, audit and critique system documentation.

Generate user help documentation for ease of access to the RDBMS and user accounts.

Create user FAQ to provide user self-help guide.

CISP 356 Relational Database Design and Information Retrieval

| Units: | 3 |
| Hours: | 54 hours LEC |
| Prerequisite: | CISP 350 with a grade of "C" or better |
| Transferable: | CSU |
| Catalog Date: | June 1, 2019 |

This course is designed to serve as an advanced-level course within the Database Design certificate. The course covers advanced database concepts. Topics include: data analysis, principle data models with emphasis on the relational model, entity-relationship diagrams, logical design, data administration and normalization.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- SLO#1: assess and utilize knowledge of the scientific method in database design.
- compare and contrast the scientific method to other ways of information retrieval.
- evaluate and report the various advantages and disadvantages.
- SLO#2: evaluate the various relational database design approaches.
- analyze and describe the major paradigms within database architectures.
- apply and synthesize knowledge of concepts, theory, and research findings surveyed within the following sub-disciplines in database modeling: Semantic object modeling, object oriented modeling, entity relationship diagrams, data normalization, network and hierarchical architectures.
- SLO#3: infer and sketch trends within the field.
- develop and evaluate information retrieval and presentation techniques including SQL, form and report generation.
- adapt and extrapolate the database modeling and information retrieval processes and its connection to other fields.
- SLO#4: critique, analyze and demonstrate tradeoffs in relational database design methodologies.
CISP 360 Introduction to Structured Programming

This course is an introduction to structured programming. Sample topics include typed variables and constants, operators, control structures, standard libraries, arrays, pointers, I/O with keyboard/monitor and files, and an introduction to objects.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- SLO 1: DEMONSTRATE AN UNDERSTANDING OF STRUCTURED PROGRAMMING CONCEPTS
  - Write clear and complete comments to describe the logic of an algorithm that has been translated into a set of structured programming instructions.
  - Create programs that accept input from either the keyboard or a file and to send output to a file or the monitor.
  - Organize conditional and repeated algorithm steps into conditional (If) and looping control statements.
  - Organize program instructions into logically separate procedures. Each procedure will communicate with other procedures through argument lists.
  - Write instructions to store data temporarily (in variables, constants, or arrays) or permanently (in files).
  - Select an appropriate data type (integer, floating point, character, string, boolean, etc.) to temporarily store intermediate results.
  - Compare the advantages and disadvantages of using local, procedure, and global scope for variables. Select the appropriate variable scope for assigned programs.
  - Compare and contrast the use of arrays and structures. Select the appropriate one for assigned programs.
  - Dynamically allocate and access memory using a language concept such as pointers.
- SLO 2: DISCUSS AT AN INTRODUCTORY LEVEL THE USE OF CLASSES AND OBJECTS IN A PROGRAM
  - Compare the use of objects to store data with the use of non-object variables or arrays or structures.
  - Recognize the format of a class definition and the relationship between a class and objects that are based on that class.
- SLO 3: USE DEBUGGING SOFTWARE TO TEST PROGRAMS FOR CORRECT EXECUTION
  - Test completed programs for correct execution using a set of possible input values. Debugger software will be used to view intermediate results for input values that lead to incorrect results.
CISP 370 Beginning Visual Basic

Units: 4
Hours: 54 hours LEC; 54 hours LAB
Prerequisite:
Advisory:
Transferable:
General Education:
Catalog Date: June 1, 2019

This course covers development of Windows-based desktop applications using VB.NET. Topics include best practices for GUI design, use of the Visual Studio .NET development software, organizing code into procedures and modules, calculation techniques, input data validation, file I/O, variable scope, arrays, multiple-window applications, and class development. This course is designed for students who want a strong foundation in building GUI applications and transfer MIS majors.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- **SLO #1**: Design and develop robust Graphical User Interfaces (GUIs).
- Choose input and output controls to place on the GUI that allow clear communication between the program and the end user.
- Design GUI behavior to limit user options with the techniques of hiding or disabling controls based on the previous user actions.
- Ensure that positive user action is required to display the output for each new set of inputs.
- Use common VB.NET Windows controls effectively in an application. Examples are the TextBox, CheckBox, RadioButton, Label, PictureBox, GroupBox, ListBox, and ComboBox.

- **SLO #2**: Implement programming logic using Visual Basic procedures.
- Implement logic within event handler procedures to respond to user actions on the GUI such as clicking, scrolling over, and tabbing.
- Demonstrate understanding of the use of by-reference and by-value parameters in procedures.
- Use pre-existing procedures such as `Val()` and `IsNumeric()` to simplify a program.

- **SLO #3**: Develop and implement input data validation.
- Implement logic that ensures that input data is valid before using the data.
- Hide or disable controls on the GUI and alert the user of an input error for invalid input data.
Student Learning Outcomes

Upon completion of this course, the student will be able to:

- Develop and implement data storage strategies.
- Create variables of the appropriate type and scope for temporary storage of data.
- Write to a text file to permanently store data.
- Read input data from a text file.
- Group related data and procedures together.
- Temporarily store related constants in a construct such as an enumeration.
- Temporarily store related data in one-dimensional and two-dimensional arrays.
- Organize functionally related controls in a "grouping" control such as a GroupBox.
- Organize a block of code that performs a single task into a custom procedure. If the task is calculation of a single value, use a function. For all other tasks, use a subroutine.
- Organize related clickable operations into a pull-down or pop-up menu.
- Recognize a class as a grouping of functionally related variables and procedures.
- Use the Integrated Development Environment (IDE) to build, compile, execute, and debug Visual Basic applications.
- Create a Windows Application project.
- Uncover answers to syntax questions using the Help utility of the IDE.

CISP 400 Object Oriented Programming with C++

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This course is an intermediate C++ course designed to further enhance the students' abilities to design and develop object-oriented programs. Included is an emphasis in higher level programming skills development. Detailed information into class design and implementation, function templates, dynamic data allocation, pointers, strings, arrays, control structures, operator overloading, inheritance, virtual functions, polymorphism, data stream input and output, exception handling and file processing. (C-ID COMP 122)
- SLO #1: DEMONSTRATE AN UNDERSTANDING OF C++ OBJECT ORIENTED PROGRAMMING (OOP) CONCEPTS.
  - understand and recall an intermediate-level of OOP terminology, such as inheritance, composition, and polymorphism.
  - compare and contrast C and C++ languages and understand and know how to use the existing classes and functions.
- SLO # 2: APPLY THE LEARNED CONCEPTS TO CREATE EFFECTIVE AND EFFICIENT PRODUCTION C++ PROGRAMS.
  - Design and implement higher level programming interfaces through the use of abstract data type (ADT) and create new classes.
  - Design and implement intermediate level programming assignments by using operator overloading, templates, exception handling, file processing, pointers and strings.
- SLO # 3: USE WINDOWS DEBUGGING SOFTWARE TO TEST PROGRAMS FOR CORRECT EXECUTIONS.
  - Work with non-text files and design programs in a graphic user interface compiler.
- SLO # 4: COMMUNICATE, SUPPORT, ANALYZE AND ADAPT DIFFERENT LOGIC AND PROGRAMS.
  - Work effectively as part of a project team.

CISP 401 Object Oriented Programming with Java

**Units:** 4
**Hours:** 54 hours LEC; 54 hours LAB
**Prerequisite:** CISP 360 with a grade of "C" or better
**Transferable:** CSU; UC
**Catalog Date:** June 1, 2019

This course is an introduction to object oriented programming using the Java language. The student will learn the Java programming language as well as the Java compiler. Topics will include: creating Java applications, writing Java applets, using the control statements, creating Java methods, declaring Java arrays, object-based programming, object-oriented programming: inheritance and polymorphism, handling strings and characters, controlling graphics by using graphics and Java 2D, generating graphics by using graphical user interface components, exception handling, multithreading, and managing files and streams handling.

**Student Learning Outcomes**

Upon completion of this course, the student will be able to:

- SLO #1: DISCOVER AND UNDERSTAND THE OBJECT ORIENTED JAVA PROGRAMMING CONCEPTS, KNOWLEDGE AND POTENTIALS.
- Understand the Java software development "Process and Object Oriented Methodology" (such as Inheritance, Polymorphism, Abstract Classes, and Interfaces).
- Comprehend the Java Applications, Applets, multithreading and GUI Components creations.
- Demonstrate knowledge in Strings Handling, Function Overloading, and Arithmetic Operations of Java language.
- Describe the Data and Files process, Input / Output Control and exception handling.
- SLO # 2: APPLY THE LEARNED JAVA KNOWLEDGE TO CREATE EFFECTIVE AND EFFICIENT PRODUCTION JAVA PROGRAMS USED IN COMPUTERS AND WEB SITES.
- Solve a program question by using Java language.
- SLO # 3: USE JAVA INTERGRATED DEVELOPMENT ENVIRONMENT DEBUGGING SOFTWARE TO TEST PROGRAMS FOR CORRECT EXECUTIONS.
- Work in a Java IDE.
- SLO # 4: COMMUNICATE, SUPPORT, ANALYZE AND ADAPT DIFFERENT LOGIC AND JAVA PROGRAMING SKILL LEVELS WITH PROJECT TEAM MEMBERS.
- Work effectively in a team project environment.

**CISP 402 Java - Data Handling**

**Units:** 4  
**Hours:** 54 hours LEC; 54 hours LAB  
**Prerequisite:** CISP 401 with a grade of "C" or better  
**Transferable:** CSU  
**Catalog Date:** June 1, 2019

This course is an intermediate JAVA class. The student will enhance their knowledge in Java Application Program Interface (API) and programming skills. Topics will include Files and Streams, Networking, Multimedia (Images, Animation and Audio), Data Structures, Java Utilities Package and Bit Manipulation, Collections, Java Database Connectivity with JDBC™, Servlets and JavaServer Pages (JSP).

**Student Learning Outcomes**

Upon completion of this course, the student will be able to:

- SLO #1: EMPLOY JAVA TO CREATE HIGHER LEVEL PROGRAMS.
  
- Use Java to design a complete graphic user interface.
  
- Implement a data structure by using JAVA API (such as Stack, Collections, Queues, Utilities Package, etc).

- SLO #2: CONSTRUCT DATABASE AND INFORMATION SHARING ENVIRONMENTS.
  
- Compose a networking connection program and be able to share information in the environment.

- Construct Java Database Connectivity with JDBC™.
CISP 405 Object Oriented Programming using C# on Visual Studio .NET

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<tr>
<td>Catalog Date:</td>
<td>June 1, 2019</td>
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This course is an introduction to C# object-oriented programming language in a Visual Studio environment. Topics will include Visual Studio IDE, Constructors, Methods, Arrays, Inheritance, Polymorphism, Exception Handling, GUI, and Multithreading. This course is designed for students to understand the web-based as well as system development capabilities of C#.

Upon completion of this course, the student will be able to:

- **SLO #1: DISCOVER AND UNDERSTAND THE OBJECT ORIENTED C# PROGRAMMING CONCEPTS, KNOWLEDGE AND POTENTIALS.**
- Define and show how to use any or all of the following: control structures, methods, array, abstract data type, constructors, and data abstraction and information hiding.
- Implement graphic user interface, multithreading, and object oriented programming using C# program.
- **SLO # 2: APPLY THE LEARNED C# KNOWLEDGE TO CREATE EFFECTIVE AND EFFICIENT PRODUCTION C# PROGRAMS USED IN COMPUTERS AND WEB SITES.**
- Develop system and web page applications.
- **SLO # 3: USE MICROSOFT .NET INTEGRATED DEBUGGING SOFTWARES TO TEST PROGRAMS FOR CORRECT EXECUTIONS.**
- Demonstrate proficiency in using Visual Studio .NET integrated development environment.
This course applies a case study approach which incorporates techniques for systematic problem analysis, program specification, design, coding, testing, debugging and documentation of large programs. Data structures include stacks, queues, trees, lists, etc. Advanced language features related to strings, non-text files, pointers, recursion, and object-oriented programming methodology are covered. Searching and sorting techniques are discussed. Consult the class schedule for specific topics.

### Student Learning Outcomes

Upon completion of this course, the student will be able to:

- **SLO #1:** ANALYZE PROGRAMMING PROBLEMS AND DETERMINE WHAT OBJECT ORIENTED PROGRAMMING APPROACHES AND TOOLS WOULD BE MOST APPROPRIATE TO DEVELOP PROGRAMS TO RESOLVE THEM.
- Utilize OOP methodology to create program solutions.
- **SLO #2:** UNDERSTAND STORING, SORTING, AND SEARCHING TECHNIQUES ON DATA STRUCTURES.
- Implement dynamic data structures and determine which is appropriate for a given problem.
- Implement recursive modules.
- Demonstrate a fundamental understanding of various sorting and searching techniques.
- **SLO #3:** COMMUNICATE, SUPPORT, ANALYZE AND ADAPT DIFFERENT LOGIC AND PROGRAMMING SKILL LEVELS WITH PROJECT TEAM MEMBERS.
- Work effectively as part of a project team.
This course is an introduction to the discrete structures used in Computer Science with an emphasis on their applications. Topics covered include: counting methods, elementary formal logic and set theory, recursive programming and algorithm analysis, digital logic and combinational circuits, regular expressions, and finite state automata.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- Validate logical arguments within the context of computer computations. (SLO 1)
- Design and analyze simple digital circuits that mimic logical arguments.
- Construct mathematically rigorous proofs of statements involving integers and sets (such as collections of characters or strings). The proofs will include induction and by contradiction forms.
- Model simple computation using finite state automata and regular languages. (SLO 2)
- Compose a valid expression from a given regular language.
- Construct a valid recognizer from a given regular language.
- Develop and analyze patterns related to programs. (SLO 3)
- Translate floating-point and signed integer numbers into IEEE binary format.
- Construct a recursive algorithm to solve a word problem.
- Exposure to the foundational mathematics behind computing. (SLO 4)
- Recognize the mathematical definitions of, and differences between, relations and functions.
- Recognize the definition of sets and basic operations on sets.
- Recognize and use counting techniques such as the pigeonhole principle and permutations and combinations.

Computer Information Science - Security (CISS)

CISS 300 Introduction to Information Systems Security

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This course is intended for beginner users who want to increase their understanding of information security issues and practices. It is intended for end users who use computers at home or in the office. The course covers all of the need-to-know information about staying secure, including up-to-date information on relevant topics such as protecting mobile devices and wireless local area networks. Students will learn how to maintain a secure environment and avoid security attacks through a series of real-life user experiences, hands-on projects, and case projects.

### Student Learning Outcomes

Upon completion of this course, the student will be able to:

- **ANALYZE FUNDAMENTAL SECURITY CONCEPTS** (SLO #01).
  - Describe the challenges of securing information and define information security and explain why it is important.
  - Identify the types of attackers that are common today.
  - List the basic steps of an attack.

- **APPLY SOUND PERSONAL SECURITY PRINCIPALS** (SLO #02).
  - Describe personal security defenses.
  - Describe the attacks against passwords.
  - Describe identity theft and the risks of using social networking.

- **IDENTIFY THE NEEDS FOR A SECURE COMPUTER** (SLO #03).
  - List and describe the different types of attacks on computers.
  - Explain how to manage patches.
  - Describe how to install and use antivirus software.
  - Describe how to recover from an attack.

- **CONFIGURE A STRATEGY TO FIGHT AGAINST INTERNET-BASED ATTACKS** (SLO #05).
  - Explain how the Internet and e-mail work.
  - Describe how attackers can use mobile code, cookies, and fraudulent digital certificates.
  - List the security risks with using e-mail.

- **FORMULATE PROVEN SECURITY PRACTICES AT THE WORKPLACE** (SLO #06).
  - Define physical access and list the tools used to restrict it.
  - Describe how tokens and cards can be used for security.
  - Explain what a security policy is and list several different policies.
  - Define technology and procedural access control.
  - List the steps to be taken to prepare for a crisis.
CISS 310 Network Security Fundamentals

This course is an introduction to the fundamental principles and topics of Information Technology security and Risk Management at the organizational level. It also addresses hardware, software, processes, communications, applications, and policies and procedures with respect to cyber-security. In addition, this course prepares students for the CompTIA Security+ certification exam.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- **ANALYZE FUNDAMENTAL SECURITY CONCEPTS (SLO #01).**
- Describe the fundamental principles of information systems security.
- Define the concepts of threat, evaluation of assets, information assets, physical, operational, and information security and how they are related.
- Evaluate the need for the careful design of a secure organizational information infrastructure.
- Explain the need for a comprehensive security model and its implications for the security manager or Chief Security Officer (CSO).
- Explain the different types of information security careers and how the Security+ certification can enhance a security career.
- **DESCRIBE POTENTIAL SYSTEM ATTACKS AND THE ACTORS THAT MIGHT PERFORM THEM (SLO #02).**
- Describe the different types of software-based attacks
- List types of hardware attacks.
- Define virtualization and explain how attackers are targeting virtual systems.
- **ANALYZE WAYS TO HARDEN AN OPERATING SYSTEM (SLO #03).**
- Describe various software security applications.
- Explain how to protect systems from communications-based attacks.
- List ways to prevent attacks through a Web browser.
- Explain how to harden operating systems.
- **EXAMINE SOME OF THE MAJOR WEAKNESSES THAT ARE FOUND IN NETWORK SYSTEMS AND WAYS TO PREVENT THEM (SLO #04).**
- Explain the types of network vulnerabilities.
- Define different methods of network attacks.
- List the different types of network security devices and explain how they can be used.
- Define network address translation and network access control.
- Explain how to enhance security through network design.
- INVESTIGATE THE BASIC WIRELESS SECURITY PROTECTIONS AVAILABLE TO THEM (SLO #05).
- Describe the basic IEEE 802 wireless security protections.
- Define the vulnerabilities of open system authentication, WEP, and device authentication. Describe the WPA and WPA2 personal security models.
- Explain how enterprises can implement wireless security.
- INVESTIGATE LOGICAL AND PHYSICAL ACCESS CONTROL METHODS (SLO #06).
- Define access control and list the four access control models.
- Describe logical access control methods.
- Explain the different types of physical access control.
- EXAMINE AUTHENTICATION AND UNDERSTAND HOW IT FITS INTO ACCESS CONTROL (SLO #07).
- Define authentication. Describe the different types of authentication credentials.
- List and explain the authentication models.
- Define basic cryptography, its implementation considerations, and key management.
- DEFINE RISK AND RISK MANAGEMENT (SLO #08).
- Perform risk analysis and risk management.
- Describe the components of risk management.
- Apply risk management techniques to manage risk, reduce vulnerabilities, threats, and apply appropriate safeguards/controls.
- Describe how usage audits can protect security.
- List the methodologies used for monitoring to detect security-related anomalies.
- EXAMINE HOW TO PROTECT DATA USING THREE COMMON TYPES OF ENCRYPTION ALGORITHMS: HASHING, SYMMETRIC ENCRYPTION, AND ASYMMETRIC ENCRYPTION (SLO #09).
- Define cryptography and hashing.
- List the basic symmetric cryptographic algorithms.
- Describe how asymmetric cryptography works.
- List types of file and file system cryptography. Explain how whole disk encryption works.
- Define digital certificates. List the various types of digital certificates and how they are used.
- Describe the components of Public Key Infrastructure (PKI).
- FORMULATE REDUNDANCY PLANS AND SECURITY POLICIES (SLO #10).
Describe the components of redundancy planning. Describe appropriate measures to be taken should a system compromise occur.

CISS 316 Cisco Networking Academy™: CCNA Cybersecurity Operations

<table>
<thead>
<tr>
<th>Units:</th>
<th>3</th>
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<tbody>
<tr>
<td>Hours:</td>
<td>45 hours LEC; 27 hours LAB</td>
</tr>
<tr>
<td>Prerequisite:</td>
<td>None.</td>
</tr>
<tr>
<td>Advisory:</td>
<td>CISN 304 and CISS 310 with grades of &quot;C&quot; or better</td>
</tr>
<tr>
<td>Transferable:</td>
<td>CSU</td>
</tr>
<tr>
<td>Catalog Date:</td>
<td>June 1, 2019</td>
</tr>
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</table>

This course equips students with the knowledge and skills needed by today's organizations that are challenged with rapidly detecting cybersecurity breaches and effectively responding to security incidents. The student would be part of a team of people in Security Operations Centers (SOC's) keeping a vigilant eye on security systems, protecting their organizations by detecting and responding to cybersecurity threats. Cisco Certified Network Associate (CCNA) CyberOPS prepares candidates to begin a career working with associate-level cybersecurity analysts within security operations centers.

**Student Learning Outcomes**

Upon completion of this course, the student will be able to:

- **IMPLEMENT AND MANAGE CISCO SECURE NETWORKS (SLO 1)**
- Secure network devices
- Configure Authentication, Authorization and Accounting (AAA)
- **IMPLEMENT NETWORK PERIMETER DEFENSE (SLO 2)**
- Implement firewall technologies
- **ANALYZE THREATS AND VULNERABILITIES TO NETWORKS (SLO 3)**
- Implement intrusion prevention
- Implement Virtual Private Networks (VPNs)

CISS 320 Implementing Network Security and Counter Measures
This course introduces students to Intrusion Detection. It also covers such essential practices as developing a security policy and then implementing that policy by performing Network Address Translation; setting up packet filtering; and installing proxy servers; firewalls; and virtual private networks. Finally, this course includes many hands-on activities or labs along with realistic case studies.

**Student Learning Outcomes**

Upon completion of this course, the student will be able to:

- IDENTIFY NETWORK SECURITY FUNDAMENTALS (SLO #01).
- Describe potential system attacks and the actors that might perform them.
- Describe the threats to network security.
- Apply cyber defense methods to prepare a system to repel attacks.
- Describe appropriate measures to be taken should a system compromise occur.
- EXPLORE DIFFERENT APPROACHES TO RISK ANALYSIS (SLO #02).
- Explain the fundamental concepts of risk analysis.
- Describe cyber defense tools, methods and components.
- Explain the process of risk analysis.
- FORMULATE A SECURITY POLICY AND IDENTIFY SECURITY POLICY CATEGORIES (SLO #03).
- Explain best practices in security policies.
- Formulate a security policy and identify security policy categories.
- Explain the importance of ongoing risk analysis and define incident-handling procedures.
- IDENTIFY SUSPICIOUS TRAFFIC AND EVENTS (SLO #04).
- Describe the concepts of signature analysis.
- Detect normal and suspicious traffic signatures.
- Identify suspicious events.
- Explain the Common Vulnerabilities and Exposures (CVE) standard.
- SUMMARIZE THE ADVANTAGES AND DISADVANTAGES OF VIRTUAL PRIVATE NETWORKS (VPN) (SLO #05).
- Explain basic VPN concepts.
- Describe encapsulation, encryption and authentication in VPNs.
Explain design considerations for a VPN.
Explain how to set up VPNs with firewalls.
Explain how to adjust packet-filtering rules for VPNs.
IDENTIFY HOW TO USE AN INTRUSION DETECTION SYSTEM PROPERLY (SLO #06).
Explain the steps of intrusion detection.
Describe options for implementing intrusion detection systems.
Evaluate different types of IDS products.
Explain the six-step incident response process.
Describe how to respond to false alarms to reduce re-occurrences.
Explain options for dealing with legitimate security alerts.
EXPLAIN HOW TO STRENGTHEN DEFENSE THROUGH ONGOING MANAGEMENT (SLO #07).
Strengthen network control by managing security events.
Improve analysis by auditing network security procedures.
Strengthen detection by managing an intrusion detection system.
Improve network defense by changing a defense in depth configuration.
Increase their knowledge base by keeping on top of industry trends.
EXPLAIN COMMON APPROACHES TO PACKET FILTERING AND RECITE HOW TO ESTABLISH A SET OF RULES AND RESTRICTIONS FOR A FIREWALL (SLO #08).
Explain what firewalls can and cannot do.
Describe common approaches to packet filtering.
Establish a set of rules and restrictions for a firewall.
Design common firewall configurations.
Compare hardware and software firewalls.


| Units: | 3.5 |
| Hours: | 54 hours LEC; 27 hours LAB |
| Prerequisite: | None. |
| Advisory: | CISN 304 and 341 with grades of "C" or better |
| Transferable: | CSU |
| Catalog Date: | June 1, 2019 |
This course provides the theoretical understanding of network security and the hands-on skills to implement and support network security. Topics include Cisco switch and router security, Authentication, Authorization, and Accounting (AAA), Access Control Lists (ACLs), Firewalls, Intrusion Prevention System (IPS), and Virtual Private Networks (VPNs). Additionally, the Cisco Adaptive Security Appliance (ASA) and Adaptive Security Device Manager (ASDM) are covered. This course prepares students for CISCO'S Cisco Certified Network Associate (CCNA) Security certification exam.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- IMPLEMENT AND MANAGE CISCO SECURE NETWORKS (SLO 1)
  - Describe security threats facing modern network infrastructures.
  - Configure Cisco routers and switches for security.
- IMPLEMENT NETWORK PERIMETER DEFENSE (SLO 2)
  - Describe methods for implementing secure communications to ensure integrity, authenticity, and confidentiality.
  - Explain how IPsec VPNs operate.
  - Test network security and create a technical security policy.
- ANALYZE THREATS AND VULNERABILITIES TO NETWORKS (SLO 3)
  - Configure security via CCP and Cisco IOS CLI

CISS 330 Implementing Internet Security and Firewalls

<table>
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<tr>
<th>Units:</th>
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<tbody>
<tr>
<td>Hours:</td>
<td>48 hours LEC; 18 hours LAB</td>
</tr>
<tr>
<td>Prerequisite:</td>
<td>CISS 310 with a grade of &quot;C&quot; or better</td>
</tr>
<tr>
<td>Transferable:</td>
<td>CSU</td>
</tr>
<tr>
<td>Catalog Date:</td>
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With the increased connectivity to the Internet and the wide availability of automated cracking tools, organizations can no longer simply rely on operating system security to protect their valuable corporate data. The firewall has emerged as a primary tool used to prevent unauthorized access. Students will learn how to allow access to key services while maintaining your organization's security, as well as how to implement firewall-to-firewall Virtual Private Networks (VPNs).

Student Learning Outcomes

Upon completion of this course, the student will be able to:
EXPLAIN THE RELATIONSHIP AMONG THE DIFFERENT ASPECTS OF INFORMATION SECURITY, ESPECIALLY NETWORK SECURITY (SLO #01).

Define the key terms and critical concepts of information and network security.

Identify the threats posed to information and network security, as well as the common attacks associated with those threats.

Differentiate threats to information within systems from attacks against information within systems.

DESCRIBE THE BASIC ELEMENTS OF COMPUTER-BASED DATA COMMUNICATION (SLO #02).

Know the key entities and organizations behind current networking standards, as well as the purpose of and intent behind the more widely used standards.

Explain the nature and intent of the OSI reference model, and list and describe each of the model's seven layers.

Describe the nature of the Internet and the relationship between the TCP/IP protocol and the Internet.

DEFINE MANAGEMENT'S ROLE IN THE DEVELOPMENT, MAINTENANCE, AND ENFORCEMENT OF INFORMATION SECURITY POLICY, STANDARDS, PRACTICES, PROCEDURES, AND GUIDELINES (SLO #03).

Describe an information security blueprint, identify its major components, and explain how it is used to support a network security program.

Discuss how an organization institutionalizes policies, standards, and practices using education, training, and awareness programs.

Explain contingency planning, and describe the relationships among incident response planning, disaster recovery planning, business continuity planning, and contingency planning.

DISCUSS COMMON SYSTEM AND NETWORK VULNERABILITIES (SLO #04).

Name the common categories of vulnerabilities.

Locate and access sources of information about emerging vulnerabilities.

Identify the names and functions of the widely available scanning and analysis tools.

IDENTIFY THE LIMITATIONS OF FIREWALLS (SLO #05).

Identify common misconceptions about firewalls.

Explain why a firewall is dependent on an effective security policy.

Describe the types of firewall protection.

Evaluate and recommend suitable hardware and software for a firewall application.

DESCRIBE PACKETS AND PACKET FILTERING (SLO #06).

Explain the approaches to packet filtering.

Recommend specific filtering rules.

WORK WITH PROXY SERVERS AND APPLICATION-LEVEL FIREWALLS (SLO #07).

Discuss proxy servers and how they work.

Identify the goals your organization can achieve using a proxy server.
• Choose a proxy server and work with the SOCKS protocol.
• Evaluate the most popular proxy-based firewall products.
• Explain how to deploy and use reverse proxy.
• Determine when a proxy server isn’t the correct choice.

IDENTIFY AND IMPLEMENT DIFFERENT FIREWALL CONFIGURATION STRATEGIES (SLO #08).
• Understand the nature of advanced firewall functions.
• Track firewall log files, and follow the basic initial steps in responding to security incidents.
• Use a remote management interface.
• Adhere to proven security principles to help the firewall protect network resources.
• Update a firewall to meet new needs and threats.

DESCRIBE THE ROLE ENCRYPTION PLAYS IN A FIREWALL ARCHITECTURE (SLO #09).
• Discuss Internet Protocol Security (IPSec) and identify its protocols and modes.
• Analyze the workings of SSL, PGP, and other popular encryption schemes.
• Explain how digital certificates work and why they are important security tools.

DESCRIBE USER, CLIENT, AND SESSION AUTHENTICATION (SLO #10).
• Explain why authentication is a critical aspect of network security.
• Explain why firewalls authenticate and how they identify users.
• List the advantages and disadvantages of popular centralized authentication systems.
• Discuss the potential weaknesses of password security systems.
• Discuss the use of password security tools.
• Describe common authentication protocols used by firewalls.

RECOMMEND BEST PRACTICES FOR EFFECTIVE CONFIGURATION AND MAINTENANCE OF VIRTUAL PRIVATE NETWORKS (SLO #11).
• Explain the components and essential operations of virtual private networks (VPNs).
• Enable secure remote access for individual users via a VPN.
• Create VPN setups, such as mesh or hub-and-spoke configurations.
As organizations increasingly come to rely on Windows-based networks, it is essential that system administrators have a complete understanding of the security models integral to Windows Server and Workstation. This course will provide in depth explanations of operating system security features as well as step-by-step configuration guides for proper operating system configuration. It also provides the knowledge and skills students will need to know in order to maintain the integrity, authenticity, availability, and privacy of data.

### Student Learning Outcomes

Upon completion of this course, the student will be able to:

- **EXPLAIN WHAT OPERATING SYSTEM AND NETWORK SECURITY MEANS (SLO #01).**
  - Discuss why security is necessary.
  - Explain the cost factors related to security.
  - Describe the types of attacks on operating systems and networks.
  - Discuss system hardening, including features in operating systems and networks that enable hardening.

- **EXPLAIN HOW VIRUSES, WORMS, AND TROJAN HORSES SPREAD (SLO #02).**
  - Discuss typical forms of malicious software and understand how they work.
  - Use techniques to protect operating systems from malicious software and to recover from an attack.

- **EXPLAIN ENCRYPTION AND AUTHENTICATION METHODS AND HOW THEY ARE USED (SLO #03).**
  - Discuss attacks on encryption and authentication methods.
  - Explain and configure IP Security.

- **CREATE ACCOUNT NAMING AND SECURITY STRATEGIES (SLO #04).**
  - Discuss how to develop account naming and security policies.
  - Explain and configure user accounts.
  - Discuss and configure account policies and logon security techniques.

- **DISCUSS AND IMPLEMENT GLOBAL ACCESS PRIVILEGES.**
  - Discuss and implement global access privileges.
  - Use group policies and security templates.

- **IMPLEMENT DIRECTORY, FOLDER, AND FILE SECURITY (SLO #05).**
  - Configure shared resource security, using share permissions in Windows.
  - Use groups to implement security.
- Troubleshoot security.
- CONFIGURE THE FIREWALL CAPABILITIES IN OPERATING SYSTEMS (SLO #06).
- Understand how TCP, UDP, and IP work and understand the security vulnerabilities of these protocols.
- Explain the use of IP addressing on a network and how it is used for security.
- Explain border and firewall security.
- EXPLAIN PHYSICAL SECURITY METHODS FOR WORKSTATIONS, SERVERS, AND NETWORK DEVICES (SLO #07).
- Implement a network topology for security.
- Explain network communications media in relation to security.
- CONFIGURE SECURITY FOR WIRELESS INTERFACES IN WORKSTATION OPERATING SYSTEMS (SLO #08).
- Explain wireless networking and why it is used.
- Describe IEEE 802.11 radio wave networking.
- Explain Bluetooth networking.
- Describe attacks on wireless networks.
- Discuss wireless security measures.
- EXPLAIN HOW E-MAIL CAN BE SECURED THROUGH CERTIFICATES AND ENCRYPTION (SLO #09).
- Discuss general techniques for securing e-mail.
- Configure security in popular e-mail tools.
- EXPLAIN HOW TO USE DISASTER RECOVERY TECHNIQUES TO SECURE OPERATING SYSTEMS, PREVENT DATA LOSS, AND REDUCE DOWNTIME (SLO #10).
- Deploy UPS systems.
- Create hardware redundancy and apply fault-tolerance.
- Deploy RAID.
- Back up data and operating system files.
- Understand the relationship between baselining and hardening.
- Explain intrusion-detection methods.
- Use audit trails and logs.
- Monitor logged-on users.
- Monitor a network.
The UNIX family of operating systems is prized by developers and other IT professionals for their flexibility and openness. Vulnerabilities in standard configurations, however, can make UNIX systems susceptible to security threats. For the many organizations that depend upon UNIX systems, protection against intrusion is an absolute requirement. This course provides the knowledge and skills you need to establish security for the Linux platform. It will present in depth explanations of operating system security features as well as step-by-step configuration guides for proper operating system configuration. This course also will cover the knowledge and skills students will need to maintain the integrity, authenticity, availability, and privacy of data.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- EXPLAIN WHAT OPERATING SYSTEM AND NETWORK SECURITY MEANS (SLO #01).
- Discuss why security is necessary.
- Explain the cost factors related to security.
- Describe the types of attacks on operating systems and networks.
- Discuss system hardening, including features in operating systems and networks that enable hardening.
- EXPLAIN HOW VIRUSES, WORMS, AND TROJAN HORSES SPREAD (SLO #02).
- Discuss typical forms of malicious software and understand how they work.
- Use techniques to protect operating systems from malicious software and to recover from an attack.
- EXPLAIN ENCRYPTION AND AUTHENTICATION METHODS AND HOW THEY ARE USED (SLO #03).
- Discuss attacks on encryption and authentication methods.
- Explain and configure IP Security.
- CREATE ACCOUNT NAMING AND SECURITY STRATEGIES (SLO #04).
- Discuss how to develop account naming and security policies.
- Explain and configure user accounts.
- Discuss and configure account policies and logon security techniques.
- Discuss and implement global access privileges.
- Use group policies and security templates.
- IMPLEMENT DIRECTORY, FOLDER, AND FILE SECURITY (SLO #05).
- Configure shared resource security, using share permissions in Linux or UNIX.
- Use groups to implement security.
• Troubleshoot security.
• CONFIGURE THE FIREWALL CAPABILITIES IN OPERATING SYSTEMS (SLO #06).
• Understand how TCP, UDP, and IP work and understand the security vulnerabilities of these protocols.
• Explain the use of IP addressing on a network and how it is used for security.
• Explain border and firewall security.
• EXPLAIN PHYSICAL SECURITY METHODS FOR WORKSTATIONS, SERVERS, AND NETWORK DEVICES (SLO #07).
• Implement a network topology for security.
• Explain network communications media in relation to security.
• CONFIGURE SECURITY FOR WIRELESS INTERFACES IN WORKSTATION OPERATING SYSTEMS (SLO #08).
• Explain wireless networking and why it is used.
• Describe IEEE 802.11 radio wave networking.
• Explain Bluetooth networking.
• Describe attacks on wireless networks.
• Discuss wireless security measures.
• EXPLAIN HOW E-MAIL CAN BE SECURED THROUGH CERTIFICATES AND ENCRYPTION (SLO #09).
• Discuss general techniques for securing e-mail.
• Configure security in popular e-mail tools.
• EXPLAIN HOW TO USE DISASTER RECOVERY TECHNIQUES TO SECURE OPERATING SYSTEMS, PREVENT DATA LOSS, AND REDUCE DOWNTIME (SLO #10).
• Deploy UPS systems.
• Create hardware redundancy and apply fault-tolerance.
• Deploy RAID.
• Back up data and operating system files.
• Understand the relationship between baselining and hardening.
• Explain intrusion-detection methods.
• Use audit trails and logs.
• Monitor logged-on users.
• Monitor a network.
This course teaches students how to identify network vulnerabilities and how to take the appropriate countermeasures to prevent and mitigate failure risks for an organization. Students will gain an understanding of the steps needed for good disaster recovery including, how to prepare a disaster recovery plan, the various risks associated with an enterprise network, the diverse job functions of employees in a Disaster Recovery Plan, and the methods needed to implement a plan once it is complete. In addition, each student will develop a Disaster Recovery Plan with a group for a real or fictitious organization.

### Student Learning Outcomes

Upon completion of this course, the student will be able to:

- DEFINE AND EXPLAIN INFORMATION SECURITY (SLO #01).
  - Define and explain the basic concepts of risk management.
  - Identify and define the components of contingency planning.
  - Know and understand the role of information security policy in the development of contingency plans.
- MANAGE INCIDENT RESPONSE AND DISASTER RECOVERY PROCEDURES (SLO #02).
  - Identify an individual or group to create a contingency policy and plan.
  - Understand the elements needed to begin the contingency planning process.
  - Create an effective contingency planning policy.
  - Comprehend the steps needed for a business impact analysis report.
  - Summarize the steps needed to create and maintain a budget for enabling the contingency planning process.
- ANALYZE THE PROCESS OF INCIDENT RESPONSE PREPARATION (SLO #03).
  - Describe the process used to organize the incident response process.
  - Understand how policy affects the incident response planning process and how policy can be implemented to support incident response practices.
  - Describe the techniques that can be employed when forming a security incident response team (SIRT).
  - Learn the skills and components required to devise an incident response plan.
  - Know some of the concerns and trade-offs to be managed when assembling the final IR plan.
- IDENTIFY TRUE INCIDENTS FROM INCIDENT CANDIDATES AND FALSE POSITIVES (SLO #04).
  - Identify the elements necessary to detect incidents that pose risk to the organization.
  - Summarize the components of an intrusion detection system.
• Explain the processes used in making decisions surrounding incident detection and escalation.

• UNDERSTAND THE ELEMENTS OF AN INCIDENT RECOVERY RESPONSE (SLO #05).

• Build the elements of an incident recovery response, and be aware of the impact of selecting a reaction strategy, developing a notification mechanism, and the creation of escalation guidelines.

• Explain how an organization plans for and executes the recovery process when an incident occurs.

• Summarize the need for and the steps involved in the ongoing maintenance of the incident response plan.

• Summarize what forensic analysis entails, and gain an improved understanding in the processes used to collect and manage data in an electronic environment.

• PLAN FOR BUSINESS RESUMPTION FOLLOWING AN INCIDENT (SLO #06).

• Outline the relationships between the overall use of contingency planning and the subordinate elements of incident response, business resumption, disaster recovery, and business continuity planning.

• Become familiar with the techniques used for data and application backup and recovery.

• Outline the strategies employed for resumption of critical business processes at alternate and recovered sites.

• PLAN FOR A DISASTER RECOVERY (SLO #07).

• Summarize the ways to classify disasters, both by speed of onset and source.

• Explain who should form the membership of the disaster recovery team.

• Summarize the key functions of the disaster plan. Explain the key concepts included in the NIST approach to technical contingency planning.

• Describe the elements of a sample disaster recovery plan.

• Identify the need for simultaneous wide access to the planning documents as well as the need for securing the sensitive content of the DR plans.

• SUMMARIZE THE KEY CHALLENGES AN ORGANIZATION FACES WHEN ENGAGED IN DISASTER RECOVERY OPERATION (SLO #08).

• Recognize what actions organizations take to prepare for the activation of the DR plan.

• Recognize what critical elements compose the response phase of the DR plan.

• Comprehend what occurs in the recovery phase of the DR plan.

• Identify how an organization uses the resumption phase of the DR plan.

• Identify how an organization resumes normal operations using the restoration phase of the DR plan.

• OUTLINE THE ELEMENTS OF BUSINESS CONTINUITY (SLO #09).

• Recognize who should be included in the business continuity team.

• Recognize and be able to reference two sample business continuity plans.

• Describe the steps taken to maintain the BC plan.

• Summarize the methods used to continuously improve the BC process.

• CREATE AND DEVELOP A CRISIS MANAGEMENT PLAN (SLO #10).
Recognize the role of crisis management in the typical organization.

Conduct the creation of a plan preparing for crisis management.

Value and deal with post-crisis trauma and work toward getting people back to work after a crisis.

Identify the impact of the decisions regarding law enforcement involvement.

Manage a crisis communications process.

Prepare for the ultimate crisis in an organization through succession planning.

CISS 356 Introduction to Information Assurance

Units: 3

Hours: 45 hours LEC; 27 hours LAB

Prerequisite: CISS 310 with a grade of "C" or better

Transferable: CSU

Catalog Date: June 1, 2019

This course introduces the network security specialist to the various methodologies for attacking a network. Students will be introduced to the concepts, principles, and techniques, supplemented by hands-on exercises, for attacking and disabling a network within the context of properly securing a network. The course will emphasize network attack methodologies with the emphasis on student use of network attack techniques and tools and appropriate defenses and countermeasures. Students will receive course content information through a variety of methods: lecture and demonstration of hacking tools will be used in addition to a virtual environment. Students will experience a hands-on practical approach to penetration testing measures and ethical hacking.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- **SLO #01:** UNDERSTAND ETHICAL HACKING CONCEPTS, INCLUDING THE TERM "ETHICAL HACKER", AS WELL AS PENETRATION AND SECURITY TESTING CONCEPTS AND THE DIFFERENCES BETWEEN THEM
  - Describe the role of an ethical hacker. Differentiate between what you can or cannot do legally as an ethical hacker.
  - Describe how the fundamental concepts of cyber defense can be used to provide system security.
  - List the fundamental concepts of the Information Assurance discipline.

- **SLO #02:** DESCRIBE MAJOR CONCEPTS AND ASPECTS OF THE TCP/IP PROTOCOL SUITE, INCLUDING EACH OF THE FOUR LAYERS OF THE PROTOCOL STACK: APPLICATION, TRANSPORT, INTERNET, AND NETWORK
  - Describe the TCP/IP protocol stack and be able to review the addressing schemes and how they relate to TCP/IP protocol and security.
  - Explain the basic concepts of IP addressing.
  - Explain the binary, octal, and hexadecimal numbering systems.
SLO #03: CATEGORIZE THE DIFFERENT TYPES OF MALICIOUS SOFTWARE AND THEIR EFFECT ON A SOFTWARE OR HARDWARE

- Critique the physical security attacks and their vulnerabilities.
- Describe the different types of malicious software.
- Classify the different methods of protecting against malware attacks.
- Examine the architecture of a typical, complex system and identify significant vulnerabilities, risks, and points at which specific security technologies/methods should be employed.

SLO #04: EVALUATE THE VARIOUS TOOLS USED FOR PORT SCANNING

- Research the different types of port scans currently being used; the tools available to most hackers; their purpose, and function.
- Reason what ping sweeps are used for.
- Uncover how shell scripting is used to automate security tasks.

SLO #05: ANALYZE SEVERAL NETWORK SECURITY DEVICES THAT SECURITY PROFESSIONALS AND NETWORK ADMINISTRATORS CAN USE TO BETTER PROTECT THEIR NETWORKS

- Describe symmetric and asymmetric encryption algorithms. Describe possible attacks on cryptosystems.
- Critique the advantages and disadvantages of different Intrusion Detection (IDS) technology currently available.
- Critique the advantages and disadvantages of different software firewall technology currently available.
- Investigate honeypots, their purpose and usefulness in a network security plan.

SLO #06: ABILITY TO CREATE SIMPLE SCRIPTS/PROGRAMS TO AUTOMATE AND PERFORM SIMPLE OPERATIONS.

- Demonstrate their proficiency in the use of scripting languages to write simple scripts (e.g., to automate system administration tasks).
- Write simple and compound conditions within a programming language or similar environment (e.g., scripts, macros, SQL).
- Write simple linear and looping scripts.

CISS 360 Computer Forensics and Investigation

| Units: | 3 |
| Hours: | 45 hours LEC; 27 hours LAB |
| Prerequisite: | CISS 310 with a grade of "C" or better |
| Advisory: | CISC 308 |
| Transferable: | CSU |
| Catalog Date: | June 1, 2019 |
This course is an introduction to the methods used to properly conduct a computer forensics investigation beginning with a discussion of ethics, while mapping to the objectives of the International Association of Computer Investigative Specialists (IACIS) certification. Topics covered include an overview of computer forensics as a profession; the computer investigation process; understanding operating systems boot processes and disk structures; data acquisition and analysis; technical writing; and a review of familiar computer forensics tools.

<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
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<tbody>
<tr>
<td>Upon completion of this course, the student will be able to:</td>
</tr>
<tr>
<td><strong>REVIEW OF THE COMPUTER FORENSICS PROFESSION (SLO #01)</strong></td>
</tr>
<tr>
<td>Illustrate how to prepare for computer investigations and explain the difference between law enforcement agency and corporate investigations.</td>
</tr>
<tr>
<td>Explain how other organizations’ codes of ethics apply to expert testimony.</td>
</tr>
<tr>
<td><strong>SUMMARIZE HOW TO PREPARE FOR A COMPUTER INVESTIGATION (SLO #02).</strong></td>
</tr>
<tr>
<td>Apply a systematic approach to an investigation.</td>
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<tr>
<td>Describe procedures for corporate high-tech investigations.</td>
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<tr>
<td>Explain requirements for data recovery workstations and software.</td>
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<tr>
<td>Describe how to conduct an investigation.</td>
</tr>
<tr>
<td><strong>SUMMARIZE THE CERTIFICATION REQUIREMENTS FOR COMPUTER FORENSICS LABS (SLO #03).</strong></td>
</tr>
<tr>
<td>Catalog the physical requirements for a computer forensics lab.</td>
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<tr>
<td>Draft the criteria for selecting a basic forensic workstation.</td>
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<tr>
<td><strong>MEASURE THE DIFFERENT WAYS FOR PROPER DATA ACQUISITION (SLO #04).</strong></td>
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<tr>
<td>Summarize the different digital evidence storage formats being used today.</td>
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<tr>
<td>Explain ways to determine the best acquisition method.</td>
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<tr>
<td>Explain how to use acquisition tools properly.</td>
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<tr>
<td>Explain how to validate data acquisitions.</td>
</tr>
<tr>
<td><strong>CLASSIFY THE RULES FOR PROPER DIGITAL EVIDENCE HANDLING (SLO #05).</strong></td>
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<tr>
<td>Describe how to collect evidence at private-sector incident scenes.</td>
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<tr>
<td>Explain guidelines for processing law enforcement crime scenes.</td>
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<tr>
<td>Review a case to identify requirements and plan your investigation.</td>
</tr>
<tr>
<td><strong>ANALYZE HOW DATA IS STORED AND MANAGED ON AN OPERATING SYSTEMS (SLO #06).</strong></td>
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<tr>
<td>Analyze an operating system's file structure.</td>
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<tr>
<td><strong>ANALYZE SOME OF THE DIFFERENT COMPUTER FORENSICS TOOLS (SLO #07).</strong></td>
</tr>
<tr>
<td>Explain how to evaluate needs for computer forensics tools.</td>
</tr>
<tr>
<td>Describe methods for validating and testing computer forensics tools.</td>
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</tbody>
</table>
• VALIDATE THE EVIDENCE DURING THE ANALYSIS PROCESS (SLO #08).
• Describe methods of performing a remote acquisition.
• Determine what data to analyze in a computer forensics investigation.
• Integrate the necessary tools to validate data and for the most common data-hiding techniques.
• IDENTIFY AND RECONSTRUCT GRAPHICS FILES (SLO #09).
• Summarize the different types of graphics file formats being used today and describe how to identify unknown ones.
• Explain types of data compression and how to locate and recover graphics files.
• Summarize the copyright issues associated with graphic files.
• DESCRIBE THE IMPORTANCE OF NETWORK FORENSICS (SLO #10).
• Illustrate the primary concerns in conducting forensic examinations of virtual machines.
• Analyze the standard procedures for performing a live or network acquisition.
• ANALYZE EMAIL INVESTIGATIONS (SLO #11).
• GENERATE A FORENSIC REPORT (SLO #12).
• Explain the importance of reports.
• Describe guidelines for writing reports.
• Explain how to use forensics tools to generate reports.
• DESCRIBE GUIDELINES FOR TESTIFYING IN COURT (SLO #13).
• Summarize the guidelines for testifying in depositions and hearings.

Computer Information Science - Web (CISW)

CISW 300 Web Publishing

<table>
<thead>
<tr>
<th>Units:</th>
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<tbody>
<tr>
<td>Hours:</td>
<td>54 hours LEC</td>
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<td>Prerequisite:</td>
<td>None.</td>
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<tr>
<td>Advisory:</td>
<td>CISC 305</td>
</tr>
<tr>
<td>Transferable:</td>
<td>CSU</td>
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<tr>
<td>Catalog Date:</td>
<td>June 1, 2019</td>
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</table>
This course is an introduction to publishing on the Internet's World Wide Web (www). Topics include creating www pages with the HyperText Markup Language (html), organizing a series of pages into a website, and uploading web pages to a server. The course makes extensive use of the computer tools necessary to insert html tags, create images, and view web documents. This course prepares apprentice web designers and publishers to identify the information dissemination needs of a client, design appropriate World Wide Web solutions, and implement it.

### Student Learning Outcomes

Upon completion of this course, the student will be able to:

- **SLO 1: EXAMINE AND PRACTICE WEB PUBLISHING**
  - identify information dissemination situations that are suitable for online publishing on the Internet’s World Wide Web.
  - compare and contrast the goals, techniques and costs of web publishing with traditional print publishing.

- **SLO 2: CREATE WEB DOCUMENTS USING CODE**
  - apply structured design principles to the creation of World Wide Web documents using HyperText Markup Language (HTML).
  - demonstrate competence and facility with the software, hardware, and networking tools necessary for publishing documents on the World Wide Web.
  - explain the World Wide Web's open standards process and the evolution of the Web as an international communication medium.

- **SLO 3: PLAN, CONSTRUCT AND EVALUATE A WEB SITE PROJECT**
  - participate in realistic web design projects individually and as a member of a team.
  - identify the information dissemination needs of a client, design an appropriate WWW solution, implement it, present the solution to the client, and revise a necessary.
  - evaluate existing World Wide Web sites for style, structure, and usability.
  - develop strategies for expanding, maintaining and improving WWW sites once they have been created.

### CISW 304 Cascading Style Sheets

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<th>Units:</th>
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<tbody>
<tr>
<td>Hours:</td>
<td>27 hours LEC; 27 hours LAB</td>
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<tr>
<td>Prerequisite:</td>
<td>CISW 300 with a grade of &quot;C&quot; or better</td>
</tr>
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<td>Transferable:</td>
<td>CSU</td>
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</table>
This course continues the study of technical aspects of standards-based Web design for experienced students and Web professionals. Topics include the separation of content from presentation, dynamic user interaction and designing for alternative devices, using Cascading Style Sheets (CSS) in combination with Extensible Hypertext Markup Language (XHTML).

### Student Learning Outcomes

Upon completion of this course, the student will be able to:

- **SLO 1: EXAMINE AND PRACTICE USING CSS**
  - describe the differences among versions of Cascading Style Sheets (CSS), including issues of cross-platform compatibility.
  - utilize proper CSS syntax for developing internal and external style sheets.
  - differentiate between a class and id, determine which should be used for a specific situation, and apply it appropriately.
- **SLO 2: CREATE WEB DOCUMENTS USING CSS**
  - combine selectors to refine style definitions for a group of elements, and/or contextually to one or more elements when used together.
  - demonstrate proficiency in Cascading Style Sheets Positioning (CSS-P), including positioning and layering of objects on multiple web pages.

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### CISW 308 Mobile Web Development

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<tbody>
<tr>
<td>Hours:</td>
<td>27 hours LEC; 27 hours LAB</td>
</tr>
<tr>
<td>Prerequisite:</td>
<td>CISW 300 with a grade of &quot;C&quot; or better</td>
</tr>
<tr>
<td>Advisory:</td>
<td>CISW 304</td>
</tr>
<tr>
<td>Transferable:</td>
<td>CSU</td>
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<tr>
<td>Catalog Date:</td>
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In this course, students will learn to create websites that are responsive: sites that adapt their layout to the client device being used, whether it be a smartphone, tablet computer, or desktop computer/laptop. Students will learn to use CSS media queries, mobile-friendly HTML5 features, JavaScript enhancements, and various frameworks to build websites that are fluid and flexible.

### Student Learning Outcomes

Upon completion of this course, the student will be able to:

- **SLO #1: ANALYZE WAYS A WEBSITE CAN RESPOND TO THE SPECIFIC NEEDS OF THE ENVIRONMENT ON WHICH IT IS BEING VIEWED.**
• Learn how a website can present a layout that is equally - and differently - appropriate for mobile, tablet, and desktop devices.

• SLO #2: EXAMINE WAYS TO LEVERAGE THE CAPABILITIES OF HTML5 TO PRESENT MOBILE-FRIENDLY SITES.

• Understand the varying levels of support for HTML5 features among different devices.

• SLO #3: INVESTIGATE HOW TO USE CSS MEDIA QUERIES.

• Experiment and demonstrate how to use CSS Media Queries to display content modified to fit the client device.

• Integrate video and other media appropriately for mobile devices.

• SLO# 4: USE MOBILE FRAMEWORKS

• Learn how to use the jQuery Mobile and/or other similar frameworks to add support for touch and other gestures.

• Learn about and how to create grid-based layouts.

CISW 310 Advanced Web Publishing

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<tr>
<th>Units:</th>
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<tbody>
<tr>
<td>Hours:</td>
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<tr>
<td>Prerequisite:</td>
<td>CISW 300 with a grade of &quot;C&quot; or better</td>
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This course builds upon previous web publishing concepts and study. The primary focus of this course is the systematic development of interactive web sites. Topics include cascading style sheets, dynamic HTML, forms, client-side programming with JavaScript, CGI scripting with Perl, and web-database interactivity.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

• SLO 1: EXAMINE AND PRACTICE WEB PUBLISHING.

  • identify information dissemination situations that are suitable for online publishing on the Internet’s World Wide Web.

  • inventory the software, hardware, and networking tools necessary for publishing interactive web sites on the World Wide Web.

• SLO 2: CREATE WEB DOCUMENTS USING CODE.

• SLO 3: STUDY AND PRACTICE USING MULTIPLE LANGUAGES AND/OR METHODS FOR CREATING WEB PAGES.
Student Learning Outcomes

Upon completion of this course, the student will be able to:

- SLO 1: UTILIZE WEB AUTHORING SOFTWARE TO CREATE, MANAGE AND MAINTAIN WEB SITES.
  - Utilize built-in code editing features to modify and repair web pages.
  - Utilize built-in scripting language to implement appropriate web page enhancements.

- SLO 2: DEVELOP AND MANAGE EFFECTIVE WEB SITES.
  - Develop and manage effective web site file structures.
  - Design and create web sites that have effective information design and site navigation.
  - Plan and construct web sites, working individually and as a member of a team.

- SLO 3: DEVELOP STANDARDS FOR WEB SITE CONSISTENCY.

- SLO 4: CREATE DOCUMENTATION FOR WEB PAGES AND WEB SITES.
This course will reinforce and deepen many Dreamweaver topics covered in the beginning course CISW 321 by providing a more in-depth approach. In addition, the course will introduce the other Adobe components such as Flash, Flash Script, and content management using Contribute software. Other topics covered include the following: advanced page formatting using style sheets, web site behaviors, work flow enhancement, templates, libraries, dynamic data, search functions, shopping cart functions, site security, user authentication, and other web services.

**Student Learning Outcomes**

Upon completion of this course, the student will be able to:

- **SLO 1: CREATE AND MAINTAIN WEBSITES UTILIZING ADVANCED FEATURES OF A WEB AUTHORING TOOL**
  - demonstrate the use and purpose of style sheets, frames and framesets, forms and form elements, and behaviors in a web site.

- **SLO 2: DEVELOP PROFESSIONAL WEB SITES IN A REAL-WORLD ENVIRONMENT**
  - develop a fully functional web site through team collaboration and task automation.
  - demonstrate how to build a dynamic Web site which include the topics of server-side technologies, databases, and the language used to extract, insert, delete, and update data with databases such as Structured Query Language (SQL).

- **SLO 3: PRACTICE UTILIZING WEB ANIMATION**
  - develop, edit and maintain rich media content in a web site using Adobe's Flash software.
This course takes a look at designing graphics for the web. Using industry standard graphic software, students will manipulate images and create original graphics. Through lecture, demonstration and hands-on methods as well as class/instructor critiques, students will learn and practice designing graphics for use on the World Wide Web. Topics include developing graphic elements for a web site using a visual theme, creating buttons and intuitive navigational elements, making background textures and images, understanding web file formats, scanning, and creating animation.

### Student Learning Outcomes

Upon completion of this course, the student will be able to:

- **SLO 1: CREATE IMAGES FOR WEB PAGES.**
  - create buttons, bars and navigation icons for Web pages.
  - develop appropriate background images and textures.

- **SLO 2: DEDUCE THE DIFFERENCE BETWEEN VARIOUS GRAPHIC FILE FORMATS.**
  - compare and contrast the various graphic file formats and determine when it is appropriate to use each format.
  - develop simple animated graphics.

- **SLO 3: DEMONSTRATE AND PRACTICE SCANNING PROCESSES.**
  - demonstrate an understanding of the scanning process and technology.
  - compare scanning techniques.
  - transform and enhance existing graphics with transparency and special effects.
  - create graphics which can be downloaded quickly.

- **SLO 4: DISCOVER HOW TO CREATE IMAGE MAPS AND ROLLOVERS.**
  - design and create image maps.
  - create multiple-state image rollovers using copy and paste script code.

### CISW 355 Web Imaging Projects

| Units: | 2 |
| Hours: | 27 hours LEC; 27 hours LAB |
| Prerequisite: | CISW 350 with a grade of “C” or better |
| Transferable: | CSU |
| Catalog Date: | June 1, 2019 |
This course is a continuation of CISW 350. Projects and simulations developing graphics for the web are created for the purpose of marketing and advertising on the Web. The steps, procedures, and common problems encountered when producing quality graphics for professional Web sites are discussed and practiced. Real and simulated projects will include the following: compressing and uploading times, cropping and resizing, digital camera imaging, retouching and fixing photographs, photographic special effects and filters, rasterizing text, implementing backgrounds, buttons, themes, image maps, slicing, and simple animations.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- **SLO 1: CREATE IMAGES FOR WEB PAGES**
  - Generate and manipulate graphics from a variety of graphics software
  - Appraise and implement graphics for client and client base

- **SLO 2: EXAMINE AND COMPARE DIFFERENT IMAGE EDITING TOOLS AND TECHNIQUES**
  - Compare different technologies that can be used to capture and acquire digital images.
  - Examine how color and image resolution affect image quality.
  - List and differentiate Web graphic file formats and when to use them.

- **SLO 3: PLAN, CONSTRUCT, AND EVALUATE A WEB SITE PROJECT**
  - Analyze web site concepts and marketing techniques.
  - Evaluate user's short-term and long-term goals
  - Plan how to get information/photos/existing logos, etc. from users in a non-technical environment

CISW 400 Client-side Web Scripting

| Units: | 4 |
| Hours: | 72 hours LEC |
| Prerequisite: | CISW 300 with a grade of "C" or better |
| Advisory: | CISP 300 |
| Transferable: | CSU |
| Catalog Date: | June 1, 2019 |

This course emphasizes the creation of dynamic and interactive web sites using a client-side scripting language such as JavaScript. Topics include the Document Object Model of web pages, core features of the client-side scripting language, event handling, control of windows and frames, functions, and form validation.

Student Learning Outcomes

Upon completion of this course, the student will be able to:
SLO 1: EXAMINE AND PRACTICE CLIENT-SIDE SCRIPTING.
- identify dynamic and interactive web publishing situations appropriate for client-side scripting.
- recognize the various components of a web page as objects in the Document Object Model.
- analyze web publishing problems and situations and develop solutions using the client-side scripting language.

SLO 2: CREATE SCRIPTS USING CODE.
- define the core structures, statements, and syntax of the client-side scripting language.
- write functions and event handlers in the client-side scripting language.

SLO 3: CONSTRUCT DYNAMIC WEB APPLICATIONS.
- create dynamic and interactive web applications.

CISW 402 Intermediate JavaScript

In this course, students will learn advanced JavaScript techniques and good standard coding conventions. Topics include advanced form validation, creating jump menus and cascading select menus, and learning to control CSS with JavaScript to manipulating the HTML DOM. Students will also learn about AJAX and practice using it to create interactive, asynchronous web pages. Finally, students will learn to use jQuery and other similar JavaScript frameworks.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- SLO#1: EXAMINE JAVASCRIPT CODING CONVENTIONS AND THE DOM.
- Learn to use advanced techniques, such as anonymous function.
- Learn to create dynamic forms and menus with JavaScript.
- Learn to use regular expressions for advanced form validation.

- SLO #2: CREATE DYNAMIC WEB APPLICATIONS WITH JAVASCRIPT AND DYNAMIC HTML.
- Learn to create visual effects with Dynamic HTML.
- Learn to position elements dynamically.
CISW 410 Middleware Web Scripting

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<tbody>
<tr>
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<td>72 hours LEC</td>
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<tr>
<td>Prerequisite:</td>
<td>CISW 300 with a grade of &quot;C&quot; or better</td>
</tr>
<tr>
<td>Advisory:</td>
<td>CISP 300 or CISW 310</td>
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<tr>
<td>Transferable:</td>
<td>CSU</td>
</tr>
<tr>
<td>Catalog Date:</td>
<td>June 1, 2019</td>
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</table>

This course emphasizes the creation of dynamic and interactive web sites using a middleware scripting language such as PHP or ASP. Topics include core features of the middleware scripting language, embedding server commands in HTML pages, control structures, functions, arrays, form validations, cookies, environmental variables, email applications, and database-driven web applications.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- SLO 1: EXAMINE AND PRACTICE MIDDLEWARE SCRIPTING.
  - identify interactive web publishing situations appropriate for middleware web scripting.
  - define the core structures, statements, and syntax of the middleware scripting language.
  - analyze web publishing problems and situations and develop solutions in the middleware scripting environment.

- SLO 2: CREATE SCRIPTS USING CODE.
  - write functions using the middleware scripting language.

- SLO 3: CONSTRUCT DYNAMIC WEB APPLICATIONS.
  - create interactive web applications.
XML is a universal method for representing information that is especially well suited for distribution over the Internet. This course will address the most fundamental XML questions - what XML is, why it is needed, and how it can be used. Students will learn the most current, practical XML technologies available at the present time.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- **SLO 1: EXAMINE AND PRACTICE USING EXTENSIBLE MARKUP LANGUAGE (XML).**
  - identify and utilize fundamental syntax of XML structure.
  - utilize and employ XML applications.
- **SLO 2: CREATE AND PRESENT XML DOCUMENTS.**
  - produce XML documents.
  - design and present XML documents using style sheets.
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