Computer Information Science

Overview

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.

View the CRC CIS Course Sequence (crc/main/doc/programs/course-sequences/cis-sequence.pdf).

Degrees and Certificates Offered

- A.S. in CIS - Computer Science
- A.S. in Cybersecurity and Information Assurance
- A.S. in Information Technology Associate
- A.S. in Management Information Systems
- A.S. in Server Administrator
- A.S. in Web Developer
- Business Information Worker Certificate
- CIS - Computer Programmer-SQL Certificate
- CIS - Database Analyst-SQL Certificate
- CIS - Database Design Certificate
- CIS - Object Oriented Software Development Certificate
- CIS - Programming in C/C++ Certificate
- CIS - Relational Database Administration Certificate
- CIS - Web Programming Certificate
- CIS - Web Publishing Certificate
- Computer Science Certificate
- Cybersecurity Certificate
- Information Technology Associate Certificate
- Information Technology Technician Certificate
- Server Administrator Certificate

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.

**Degree 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>3¹</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>Spring Semester only:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CISP 310</td>
<td>Assembly Language Programming for Microcomputers</td>
<td>4</td>
</tr>
<tr>
<td>4th Semester:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CISP 430</td>
<td>Data Structures</td>
<td>4</td>
</tr>
</tbody>
</table>

**Total Units:** 22

¹The 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 Cybersecurity and Information Assurance**

This program prepares IT professionals to apply knowledge and experience in risk management and digital forensics to safeguard infrastructure and secure data through continuity planning and disaster recovery operations. Courses deliver proven methods for information security using software analysis techniques, cloud management, and networking strategies to prevent, detect, and mitigate cyber attacks. This program also provides preparation for several nationally recognized, high demand certifications in the field of Cybersecurity.

**HIGHLIGHTS:**

* Hands-on experience in a state-of-the-art Cybersecurity computer lab.
* Part-time Cybersecurity Instructional Assistant (IA) in BS-145A to assist both students and instructors.
* CAE designation (pending) (https://tinyurl.com/t6a764o).
* 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:**

* This degree covers up to five CompTIA and three CISCO certification exams (note: the exams must be taken separately).
* 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.
* Students who want to complete this degree in two years will have to take five or more courses per semester and some courses over the summer. In most cases it will take students three to four years to complete if not done full-time.

**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.

**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>3¹</td>
</tr>
<tr>
<td>CISC 360</td>
<td>Information &amp; Communication Technology Essentials (A+)</td>
<td>4²</td>
</tr>
<tr>
<td>CISM 300</td>
<td>Network Systems Administration (3)</td>
<td>3³</td>
</tr>
<tr>
<td>Fall (Core):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CISS 310</td>
<td>Network Security Fundamentals</td>
<td>3⁴</td>
</tr>
<tr>
<td>CISS 315</td>
<td>Ethical Hacking</td>
<td>3</td>
</tr>
<tr>
<td>CISS 316</td>
<td>Cisco Networking Academy™: CCNA Cybersecurity Operations</td>
<td>3</td>
</tr>
</tbody>
</table>

¹¹The corequisite for this course can be applied to the CRC graduation requirements.
COURSE CODE | COURSE TITLE | UNITS
---|---|---
CISN 341 | CISCO Networking Academy (CCNA)™: Networking Theory and Routing Technologies | 3.5

Spring (Core):
CISN 342 | CISCO Networking Academy (CCNA)™: Enterprise Networking, Security, and Automation | 3.5

Fall (Core):
CISS 350 | Disaster Recovery | 3
CISS 353 | Management of Information Security | 3

Spring (Core):
CISS 360 | Computer Forensics and Investigation | 3

Total Units: 44.5

1 or CompTIA’s ITF certification
2 or CompTIA’s A+ certification
3 or CompTIA’s Server+ certification
4 or CompTIA’s Security+ certification
5 offered odd years only

The Cybersecurity and Information Assurance 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:

- 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, information technology specialist (State of California) and more.

A.S. in Information Technology Associate

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: January 1, 2022

Degree Requirements

COURSE CODE | COURSE TITLE | UNITS
---|---|---
Fall/Spring/Summer (Foundational):
CISC 310 | Introduction to Computer Information Science | 3
CISC 360 | Information & Communication Technology Essentials (A+)| 4

Spring (Core):
CISN 304 | Networking Technologies (3) | 3
CISP 370 | Beginning Visual Basic (4) | 3 - 4
or CISP 360 | Introduction to Structured Programming (4) |
or CISS 321 | Scripting for Cyber Security (3) |

Fall (Core):
A minimum of 6 units from the following: 6
CISN 300 | Network Systems Administration (3) |
CISP 351 | Introduction to Relational Database Design and SQL (3) |
CISN 310 | Network Security Fundamentals (3) |
CISP 315 | Ethical Hacking (3) |
CISN 360 | Computer Forensics and Investigation (3) |
BUS 310 | Business Communications (3) |

Fall/Spring (Math Requirement):
A minimum of 4 units from the following: 4
STAT 300 | Introduction to Probability and Statistics (4) |
MATH 341 | Calculus for Business and Economics (4) |
The Information Technology Associate 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 #1: Apply fundamental knowledge of computing and the current use of technology techniques, skills, and tools necessary for the computing practice.
- PSLO #2: Evaluate and solve business problems with technology solutions using qualitative and quantitative information.
- PSLO #3: Assess user needs in the selection, creation, evaluation and administration of computer-based information systems.
- PSLO #4: 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.

### 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:**
- 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

January 1, 2022

### Degree Requirements

#### COURSE CODE | COURSE TITLE | UNITS
---|---|---
**Business:**
BUSB 300 | Introduction to Business | 3
BUSB 340 | Business Law | 3
**Accounting:**
ACCT 301 | Financial Accounting | 4
ACCT 311 | Managerial Accounting | 4
**Economics:**
ECON 302 | Principles of Macroeconomics | 3
ECON 304 | Principles of Microeconomics | 3
**Mathematics:**
MATH 341 | Calculus for Business and Economics (4) | 4 - 5
or MATH 343 | Modern Business Mathematics (4) |
or MATH 355 | Calculus for Biology and Medicine I (4) |
or MATH 400 | Calculus I (5) |
STAT 300 | Introduction to Probability and Statistics | 4
CISA 315 | Introduction to Electronic Spreadsheets (2) | 2
0 - 4
or [ CISA 305 | Beginning Word Processing (2) |
and CISA 340 ] | Presentation Graphics (2) |
**Computer Information Science:**
CISC 310 | Introduction to Computer Information Science | 3
**Lower Division Requirement for MIS Concentration:**
CISP 370 | Beginning Visual Basic | 4
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 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 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 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, 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: January 1, 2022

Degree Requirements

<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall/Spring/Summer (Prerequisite):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CISC 310</td>
<td>Introduction to Computer Information Science</td>
<td>3(^1)</td>
</tr>
<tr>
<td>CISC 360</td>
<td>Information &amp; Communication Technology Essentials (A+)</td>
<td>4(^2)</td>
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<tr>
<td>Fall (Foundational):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CISP 300</td>
<td>Network Systems Administration</td>
<td>3</td>
</tr>
<tr>
<td>CISP 304</td>
<td>Networking Technologies (3)</td>
<td>3 - 3.5(^3)</td>
</tr>
<tr>
<td>or CISP 341</td>
<td>CISCO Networking Academy (CCNA)tm: Networking Theory and Routing Technologies (3.5)</td>
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<tr>
<td>Spring (Core):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CISP 302</td>
<td>Intermediate Network Systems Administration</td>
<td>3</td>
</tr>
<tr>
<td>CISP 306</td>
<td>Advanced Network Systems Administration</td>
<td>3</td>
</tr>
<tr>
<td>CISP 370</td>
<td>Beginning Visual Basic (4)</td>
<td>3 - 4</td>
</tr>
</tbody>
</table>
COURSE CODE | COURSE TITLE |
--- | --- |
CISS 321 | Scripting for Cyber Security (3) |

Fall/Spring (Core):

CISS 310 | Network Security Fundamentals |

A minimum of 3 units from the following:

CISS 301 | Network Client Systems Administration (3) |
CISS 303 | Network Administration - Linux Server (3) |

Fall/Spring (Core):

A minimum of 6 units from the following:

CISS 315 | Ethical Hacking (3) |
CISS 316 | Cisco Networking Academy™: CCNA Cybersecurity Operations (3) |
CISS 327 | Cisco Networking Academy™: CCNA Security: Implementing Network Security (3.5) |
CISS 350 | Disaster Recovery (3) |
CISS 353 | Management of Information Security (3) |
CISS 360 | Computer Forensics and Investigation (3) |

Fall/Spring (Math Requirement):

A minimum of 4 units from the following:

STAT 300 | Introduction to Probability and Statistics (4) |
MATH 341 | Calculus for Business and Economics (4) |
MATH 343 | Modern Business Mathematics (4) |
MATH 400 | Calculus I (5) |

Fall/Spring/Summer (Core):

CISC 498 | Work Experience in Computer Information Science - Core |

Total Units: 39 - 43.5

1 or CompTIA's ITF+ certification
2 or CompTIA's A+ certification
3 or CompTIA Network+ certification
4 or CompTIA's Security+ certification
5 CompTIA Linux+ certification may substitute CISN 303

The 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

Information Technology Associate (State of California), Server Administrator, Systems Administrator, Network Administrator, Information Systems Administrator, Network Operations Analyst, Network Technician, or Technical Support Specialist.

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: January 1, 2022

Degree Requirements

<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIWS 300</td>
<td>Web Publishing</td>
<td>3</td>
</tr>
<tr>
<td>CIWS 304</td>
<td>Cascading Style Sheets</td>
<td>2</td>
</tr>
<tr>
<td>CISC 323</td>
<td>Linux Operating System</td>
<td>1</td>
</tr>
<tr>
<td>CISP 353</td>
<td>Application Development in a Client Server Environment</td>
<td>3</td>
</tr>
</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: January 1, 2022

Certificate Requirements

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: January 1, 2022

Certificate Requirements

<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>UNITS</th>
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</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>
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<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>
</tr>
</tbody>
</table>

A minimum of 2 units from the following:

- CISP 370   Beginning Visual Basic (4)
- or CISA 320 Introduction to Database Management (1)
- or CISA 321 Intermediate Database Management (1)

Total Units: 19

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: January 1, 2022

Certificate Requirements

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<td>CISC 324</td>
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<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></td>
<td>Total Units:</td>
<td>14</td>
</tr>
</tbody>
</table>

Student Learning Outcomes

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.

Catalog Date: January 1, 2022

Certificate Requirements

<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>UNITS</th>
</tr>
</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>
</tr>
<tr>
<td></td>
<td>A minimum of 4 units from the following:</td>
<td>4</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>
<td></td>
</tr>
<tr>
<td></td>
<td>A minimum of 4 units from the following:</td>
<td>4</td>
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<tr>
<td>CISW 300</td>
<td>Web Publishing (3)</td>
<td></td>
</tr>
<tr>
<td>or CISW 400</td>
<td>Client-side Web Scripting (4)</td>
<td></td>
</tr>
<tr>
<td>or CISW 410</td>
<td>Middleware Web Scripting (4)</td>
<td></td>
</tr>
</tbody>
</table>
or CISC 306 Introduction to Web Page Creation (1)
or CISC 305 Introduction to the Internet (1)

Total Units: 16

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.
- SLO# 2: Analyze and employ relational database technologies to solve common business problems using standard database principles and practices.
- 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.
- SLO# 5: 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

Career Information

Computer Operator; Applications Software Specialist; Programmer; Data Entry Specialist; Database Designer; Database Developer.

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: January 1, 2022

Certificate Requirements

<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>UNITS</th>
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<tbody>
<tr>
<td>CISP 401</td>
<td>Object Oriented Programming with Java</td>
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<tr>
<td>CISP 402</td>
<td>Java - Data Handling</td>
<td>4</td>
</tr>
<tr>
<td>CISP 370</td>
<td>Beginning Visual Basic</td>
<td>4</td>
</tr>
<tr>
<td>CISP 400</td>
<td>Object Oriented Programming with C++ (4)</td>
<td>4</td>
</tr>
<tr>
<td>CISP 405</td>
<td>Object Oriented Programming using C# on Visual Studio .NET (4)</td>
<td></td>
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</tbody>
</table>

A minimum of 8 units from the following:

- CISP 370 Beginning Visual Basic (4)
- CISP 400 Object Oriented Programming with C++ (4)
- CISP 405 Object Oriented Programming using C# on Visual Studio .NET (4)

Total Units: 16

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 under graduate and graduated study. It could be used for students to improvement their job skills in high tech computer science, computer 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: January 1, 2022

Certificate Requirements

<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>UNITS</th>
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<tbody>
<tr>
<td>CISP 300</td>
<td>Algorithm Design/Problem Solving</td>
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<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>
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<tr>
<td>CISP 430</td>
<td>Data Structures</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>
<tr>
<td>or CISP 405</td>
<td>Object Oriented Programming using C# on Visual Studio .NET (4)</td>
<td></td>
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</tbody>
</table>

Total Units: 19

Student Learning Outcomes

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: January 1, 2022

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>
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<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>
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<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>
<td>3</td>
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<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>
</tbody>
</table>

Total Units: 19

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).
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:** January 1, 2022

### Certificate Requirements

<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>UNITS</th>
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</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>
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</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</td>
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</tr>
<tr>
<td>CISC 324</td>
<td>Intermediate Linux Operating System</td>
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<tr>
<td>CISP 350</td>
<td>Database Programming</td>
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<tr>
<td>CISP 360</td>
<td>Introduction to Structured Programming</td>
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<tr>
<td>CISP 380</td>
<td>Database Programming</td>
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<tr>
<td>CISP 380</td>
<td>Client-side Web Scripting</td>
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<tr>
<td>CISP 400</td>
<td>XML: Introduction to Extensible Markup Language (2)</td>
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<tr>
<td>CISP 402</td>
<td>Intermediate JavaScript</td>
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<tr>
<td>CISP 410</td>
<td>Middleware Web Scripting</td>
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<tr>
<td>CISP 400</td>
<td>Advanced Web Publishing</td>
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<tr>
<td>CISA 321</td>
<td>Intermediate Database Management</td>
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</tr>
<tr>
<td>CISP 324</td>
<td>Mobile Web Development</td>
<td>2</td>
</tr>
<tr>
<td>CISP 308</td>
<td>Mobile Web Development</td>
<td>2</td>
</tr>
</tbody>
</table>

**Total Units:** 32

1. Unix Operating System

2. C or C#

### 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; Systems Analyst; Programmer; Data Entry Specialist; Computer Systems Specialist; Computer 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:** January 1, 2022
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</td>
</tr>
<tr>
<td>or CISC 323</td>
<td>Linux Operating System (1)</td>
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</tr>
<tr>
<td>CISW 350</td>
<td>Imaging for the Web</td>
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<tr>
<td>CISW 300</td>
<td>Web Publishing</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>
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<tbody>
<tr>
<td>ART 301</td>
<td>Digital Drawing and Composition (3)</td>
</tr>
<tr>
<td>PHOTO 400</td>
<td>Digital Imaging (3)</td>
</tr>
<tr>
<td>ARTNM 324</td>
<td>Digital Design (3)</td>
</tr>
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</table>

**A minimum of 4 units from the following:**

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<thead>
<tr>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
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<tbody>
<tr>
<td>CISC 306</td>
<td>Introduction to Web Page Creation (1)</td>
</tr>
<tr>
<td>CISC 321</td>
<td>Web Site Development using Dreamweaver (3)</td>
</tr>
<tr>
<td>CISW 310</td>
<td>Advanced Web Publishing (4)</td>
</tr>
<tr>
<td>CISA 340</td>
<td>Presentation Graphics (2)</td>
</tr>
<tr>
<td>CISW 400</td>
<td>Client-side Web Scripting (4)</td>
</tr>
<tr>
<td>CISW 410</td>
<td>Middleware Web Scripting (4)</td>
</tr>
<tr>
<td>CISW 355</td>
<td>Web Imaging Projects (2)</td>
</tr>
<tr>
<td>CISW 304</td>
<td>Cascading Style Sheets (2)</td>
</tr>
<tr>
<td>CISW 326</td>
<td>Intermediate Web Site Development using Dreamweaver (3)</td>
</tr>
<tr>
<td>CISW 308</td>
<td>Mobile Web Development (2)</td>
</tr>
</tbody>
</table>

**Total Units:** 15

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

2CISW 310 is recommended to meet this 4-unit requirement.

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

Computer Science Certificate

This program is an overview of computer programming.

Students who earn this certificate will likely be:

1) transferring as a Computer Science or Computer Engineering major to a California university campus without earning the Computer Science A.S. degree

2) learning to be a programmer to enhance their career

**Catalog Date:** January 1, 2022

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++ (4)</td>
<td>4</td>
</tr>
<tr>
<td>or CISP 401</td>
<td>Object Oriented Programming with Java (4)</td>
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</tr>
<tr>
<td>CISP 310</td>
<td>Assembly Language Programming for Microcomputers</td>
<td>4</td>
</tr>
<tr>
<td>CISP 430</td>
<td>Data Structures</td>
<td>4</td>
</tr>
<tr>
<td>CISP 440</td>
<td>Discrete Structures for Computer Science</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total Units:** 22

1Please speak with a CISP professor about which of these two courses are best for your educational goal.
Upon completion of this program, the student will be able to:

- Design an algorithm from data types, operations, and logic structures to solve complex problems.
- Refactor a complex algorithm into single job components such as functions or modules.
- Translate an algorithm into a low-level or high-level programming language.
- Compare and contrast the data, operations, and logic structure of a high-level language such as C++ and a low-level language such as Assembly Language.
- Organize data and functions into classes.
- Organize data into structures such as trees, linked lists, and dictionaries.
- Construct a recursive algorithm to solve a word problem.

Career Information

The North/Far North Center of Excellence, April 2019 compiled a report that gave the job prospects for software development occupations in the Sacramento region. The report found that Computer Programmers, Software Developers (Applications and Systems Software), and Web Developers have been and will continue to be in demand. The demand for these occupations is expected to increase in the Greater Sacramento region. The report noted that these careers pay well above the Sacramento County Living Wage.

Cybersecurity Certificate

This certificate provides graduates with the skills needed to defend networks and information systems against cyber-attacks. Students receive extensive hands-on experience and develop 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: January 1, 2022

Certificate Requirements

<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>UNITS</th>
</tr>
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<tbody>
<tr>
<td>CISC 310</td>
<td>Introduction to Computer Information Science</td>
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<tr>
<td>CISC 360</td>
<td>Information &amp; Communication Technology Essentials (A+)</td>
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<tr>
<td>CISN 300</td>
<td>Network Systems Administration (3)</td>
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</tr>
<tr>
<td>CISN 304</td>
<td>Networking Technologies</td>
<td>3</td>
</tr>
<tr>
<td>CISN 341</td>
<td>CISCO Networking Academy (CCNA)tm: Networking Theory and Routing Technologies</td>
<td>3.5</td>
</tr>
<tr>
<td>CISS 310</td>
<td>Network Security Fundamentals</td>
<td>3</td>
</tr>
<tr>
<td>CISS 316</td>
<td>Cisco Networking Academy™: CCNA Cybersecurity Operations</td>
<td>3</td>
</tr>
<tr>
<td>CISN 342</td>
<td>CISCO Networking Academy (CCNA)tm: Enterprise Networking, Security, and Automation</td>
<td>3.5</td>
</tr>
</tbody>
</table>

Total Units: 29.5

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

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.

Information Technology Associate 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.

Certificate Requirements

<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>UNITS</th>
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<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>3 - 4</td>
</tr>
<tr>
<td>or CISP 360</td>
<td>Introduction to Structured Programming (4)</td>
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</tr>
<tr>
<td>or CISS 321</td>
<td>Scripting for Cyber Security (3)</td>
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A minimum of 6 units from the following:

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<tr>
<td>CISN 300</td>
<td>Network Systems Administration (3)</td>
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</tr>
<tr>
<td>CISP 351</td>
<td>Introduction to Relational Database Design and SQL</td>
<td></td>
</tr>
<tr>
<td>CISS 310</td>
<td>Network Security Fundamentals (3)</td>
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</tr>
<tr>
<td>CISS 315</td>
<td>Ethical Hacking (3)</td>
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</tr>
<tr>
<td>CISS 360</td>
<td>Computer Forensics and Investigation (3)</td>
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<tr>
<td>BUS 310</td>
<td>Business Communications (3)</td>
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A minimum of 4 units from the following:

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

Total Units: 23 - 24

Student Learning Outcomes

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

- PSLO #1: Apply fundamental knowledge of computing and the current use of technology techniques, skills, and tools necessary for the computing practice.
- PSLO #2: Evaluate and solve business problems with technology solutions using qualitative and quantitative information.
- PSLO #3: Assess user needs in the selection, creation, evaluation and administration of computer-based information systems.
- PSLO #4: Demonstrate appreciation of the Information Technology career field and the need to be lifelong learners.

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.

Information Technology 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.

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 (3)</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 300</td>
<td>Network Systems Administration</td>
<td>3</td>
</tr>
<tr>
<td>CISN 304</td>
<td>Networking Technologies (3)</td>
<td></td>
</tr>
<tr>
<td>or CISN 341</td>
<td>CISCO Networking Academy (CCNA): Networking Theory and Routing Technologies (3)</td>
<td></td>
</tr>
<tr>
<td>CISN 301</td>
<td>Network Client Systems Administration</td>
<td>3</td>
</tr>
<tr>
<td>CISS 310</td>
<td>Network Security Fundamentals</td>
<td>3</td>
</tr>
<tr>
<td>CISN 490</td>
<td>Networking Helpdesk Practicum</td>
<td>3</td>
</tr>
</tbody>
</table>

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<table>
<thead>
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</tr>
</thead>
<tbody>
<tr>
<td>CISC 498</td>
<td>Work Experience in Computer Information Science - Core (1 - 4)</td>
<td></td>
</tr>
<tr>
<td>CISN 302</td>
<td>Intermediate Network Systems Administration</td>
<td></td>
</tr>
<tr>
<td>COURSE CODE</td>
<td>COURSE TITLE</td>
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<td>-------------</td>
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</tr>
<tr>
<td>CISN 303</td>
<td>Network Administration - Linux Server (3)</td>
<td></td>
</tr>
<tr>
<td>CISS 315</td>
<td>Ethical Hacking (3)</td>
<td></td>
</tr>
</tbody>
</table>

**Total Units:** 25 - 25.5

1 or CompTIA ITF+ certification
2 or CompTIA A+ certification
3 or CompTIA Network+ certification
4 or CompTIA Security+ certification
5 offered odd years only
6 CompTIA Linux+ certification may substitute CISN 303

**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 (PSLO #1).
- Demonstrate knowledge of networking technology. Judge the strengths and weaknesses of the different network operating systems and technologies (PSLO #2).
- Analyze the effects of an application on a network operating system (PSLO #3).
- Analyze the effects of network intruders and viruses on an application and an operating system (PSLO #4).

**Career Information**

Computer Operator; Applications Software Specialist; Information Technology Technician

**Server Administrator Certificate**

This certificate is designed for Information Technology 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, 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:** January 1, 2022

**Certificate Requirements**

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<td>3 - 3.5</td>
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<td>CISN 302</td>
<td>Intermediate Network Systems Administration</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 (4)</td>
<td>3 - 4</td>
</tr>
<tr>
<td>or CISS 321</td>
<td>Scripting for Cyber Security (3)</td>
<td></td>
</tr>
<tr>
<td>CISS 310</td>
<td>Network Security Fundamentals</td>
<td>3</td>
</tr>
</tbody>
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</tbody>
</table>

**A minimum of 6 units from the following:**

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</tr>
</thead>
<tbody>
<tr>
<td>CISS 315</td>
<td>Ethical Hacking (3)</td>
<td></td>
</tr>
<tr>
<td>CISS 316</td>
<td>Cisco Networking Academy™: CCNA Cybersecurity Operations (3)</td>
<td></td>
</tr>
<tr>
<td>CISS 327</td>
<td>Cisco Networking Academy™: CCNA Security: Implementing Network Security (3.5)</td>
<td></td>
</tr>
<tr>
<td>CISS 350</td>
<td>Disaster Recovery (3)</td>
<td></td>
</tr>
<tr>
<td>CISS 353</td>
<td>Management of Information Security (3)</td>
<td></td>
</tr>
<tr>
<td>CISS 360</td>
<td>Computer Forensics and Investigation (3)</td>
<td></td>
</tr>
</tbody>
</table>

**A minimum of 4 units from the following:**

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</tr>
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<tbody>
<tr>
<td>STAT 300</td>
<td>Introduction to Probability and Statistics (4)</td>
<td></td>
</tr>
</tbody>
</table>
### Computer Information Science - Applications (CISA) Courses

#### CISA 299 Experimental Offering in Computer Information Science - Applications

**Units:** 0.5 - 4  
**Prerequisite:** None.  
**Catalog Date:** January 1, 2022

This is the experimental courses description.

#### CISA 305 Beginning Word Processing

**Units:** 2  
**Hours:** 36 hours LEC  
**Prerequisite:** None.  
**Advisory:** BUSTEC 302, CISC 302, or CISC 310  
**Transferable:** CSU  
**Catalog Date:** January 1, 2022

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.

#### 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:** January 1, 2022

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.

#### CISA 315 Introduction to Electronic Spreadsheets

**Units:** 2  
**Hours:** 36 hours LEC

### 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: Apply fundamental knowledge of computing and the current use of technology techniques, skills, and tools necessary for the computing practice.
- PSLO #05: Demonstrate appreciation of the Information Technology career field and the need to be lifelong learners.

### Career Information

Information Technology Associate (State of California), Server Administrator, Systems Administrator, Network Administrator, Information Systems Administrator, Network Operations Analyst, Network Technician, or Technical Support Specialist.
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.

**CISA 316 Intermediate Electronic Spreadsheets**

- **Units:** 2
- **Hours:** 36 hours LEC
- **Prerequisite:** CISA 315 with a grade of "C" or better
- **Transferable:** CSU
- **Catalog Date:** January 1, 2022

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.

**CISA 320 Introduction to Database Management**

- **Units:** 1
- **Hours:** 18 hours LEC
- **Prerequisite:** None.
- **Advisory:** CISC 302 or 310
- **Transferable:** CSU
- **Catalog Date:** January 1, 2022

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.

**CISA 321 Intermediate Database Management**

- **Units:** 1
- **Hours:** 18 hours LEC
- **Prerequisite:** CISA 320 with a grade of "C" or better
- **Transferable:** CSU
- **Catalog Date:** January 1, 2022

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.

**CISA 340 Presentation Graphics**

- **Units:** 2
- **Hours:** 36 hours LEC
- **Prerequisite:** None.
- **Advisory:** CISC 302 or 310
- **Transferable:** CSU
- **Catalog Date:** January 1, 2022

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).

**CISA 499 Experimental Offering in Computer Information Science - Applications**

- **Units:** 0.5 - 4
- **Prerequisite:** None.
- **Transferable:** CSU
- **Catalog Date:** January 1, 2022

This is the experimental courses description.

**Computer Information Science - Core (CISC) Courses**

**CISC 295 Independent Studies in Computer Information Science - Core**

- **Units:** 1 - 3
- **Hours:** 54 - 162 hours LAB
- **Prerequisite:** None.
- **Catalog Date:** January 1, 2022

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...
CISC 299 Experimental Offering in Computer Information Science - Core

Units: 0.5 - 4  
Prerequisite: None.  
Catalog Date: January 1, 2022

This is the experimental courses description.

CISC 302 Computer Familiarization

Same As: JOUR 330  
Units: 2  
Hours: 36 hours LEC  
Prerequisite: None.  
Advisory: BUSTEC 302  
Transferable: CSU  
General Education: AA/AS Area III(b)  
Catalog Date: January 1, 2022

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.

CISC 305 Introduction to the Internet

Units: 1  
Hours: 18 hours LEC  
Prerequisite: None.  
Advisory: CISC 302 or 310  
Transferable: CSU  
Catalog Date: January 1, 2022

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.

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: January 1, 2022

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.

CISC 308 Exploring Computer Environments and the Internet

Units: 1  
Hours: 18 hours LEC  
Prerequisite: None.  
Transferable: CSU  
Catalog Date: January 1, 2022

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.

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: January 1, 2022

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.

CISC 323 Linux Operating System

Units: 1  
Hours: 18 hours LEC  
Prerequisite: None.
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.

CISC 324 Intermediate Linux Operating System

Units: 1
Hours: 18 hours LEC
Prerequisite: CISC 323 with a grade of "C" or better
Transferrable: CSU
Catalog Date: January 1, 2022

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.

CISC 356 Introduction to Local Area Networks

Units: 1.5
Hours: 27 hours LEC
Prerequisite: None.
Transferrable: CSU
Catalog Date: January 1, 2022

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.

CISC 360 Information & Communication Technology Essentials (A+)

Units: 4
Hours: 54 hours LEC; 54 hours LAB
Prerequisite: None.
Advisory: CISC 302 and 310
Transferrable: CSU
Catalog Date: January 1, 2022

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.

CISC 495 Independent Studies in Computer Information Science - Core

Units: 1 - 3
Hours: 54 - 162 hours LAB
Prerequisite: None.
Transferrable: CSU
Catalog Date: January 1, 2022

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.

CISC 498 Work Experience in Computer Information Science - Core

Units: 1 - 4
Hours: 60 - 300 hours LAB
Prerequisite: None.
Enrollment Limitation: Students must be in a paid or unpaid internship, volunteer position or job related to career goals in Computer Information Science.
Transferrable: CSU
General Education: AAAS Area III(b)
Catalog Date: January 1, 2022

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.

CISC 499 Experimental Offering in Computer Information Science - Core

Units: 0.5 - 4
Prerequisite: None.
Transferrable: CSU
Catalog Date: January 1, 2022

This is a course designed to give students an opportunity to study topics in Computer Information Science which are not included in the current course offerings. This course may
Computer Information Science - Networking (CISN) Courses

CISN 300 Network Systems Administration

Units: 3  
Hours: 45 hours LEC; 27 hours LAB  
Prerequisite: None.  
Transferable: C-ID ITIS 150  
Catalog Date: January 1, 2022

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.

CISN 301 Network Client 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: January 1, 2022

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.

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: January 1, 2022

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.

CISN 303 Network Administration - Linux Server

Units: 3  
Hours: 45 hours LEC; 27 hours LAB  
Prerequisite: CIS 360 and CISN 304 with grades of "C" or better  
Transferable: CSU  
Catalog Date: January 1, 2022

This course provides introductory coverage of Linux Network Administration. The course maps to the CompTIA Linux+ certification exam, and to SAI'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.

CISN 304 Networking Technologies

Units: 3  
Hours: 45 hours LEC; 27 hours LAB  
Prerequisite: None.  
Advisory: CIS 310 with a grade of "C" or better  
Transferable: C-ID ITIS 150  
Catalog Date: January 1, 2022

This course introduces the architecture, structure, functions, components, and models of the Internet and other computer networks. Students achieve a basic understanding of how networks operate and how to build simple local area networks (LAN), perform basic configurations for routers and switches, implement Internet Protocol (IP) and enterprise technologies, including cloud and virtualization. Students will apply the knowledge and skills required to troubleshoot, configure, and manage common network devices; establish basic network connectivity; and implement network security, standards, and protocols. Preparation for the CompTIA Network+ certification exam.

CISN 306 Advanced Network Systems Administration

Units: 3  
Hours: 45 hours LEC; 27 hours LAB  
Prerequisite: CISN 302 with a grade of "C" or better
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.

CISN 341 CISCO Networking Academy (CCNA)™: Networking Theory and Routing Technologies

Units: 3.5
Hours: 54 hours LEC; 27 hours LAB
Prerequisite: None.
Corequisite: CISN 304
Transferable: CSU
Catalog Date: January 1, 2022

The second course in the CCNA curriculum focuses on switching technologies and router operations that support small to medium business networks and includes wireless local area networks (WLANs) and security concepts. Students learn key switching and routing concepts. Students will perform basic network configuration and troubleshooting, identify and mitigate LAN security threats, and configure and secure a basic WLAN.

CISN 342 CISCO Networking Academy (CCNA)™: Enterprise Networking, Security, and Automation

Units: 3.5
Hours: 54 hours LEC; 27 hours LAB
Prerequisite: CISN 341 with a grade of "C" or better
Transferable: CSU
Catalog Date: January 1, 2022

This course provides advanced routing and switching technologies. Topics include advanced router configurations, network management, network design, WANs concepts and network security. This is the third course in preparation for CISCO CCNA certification examination. CRC is a certified CISCO Networking Academy, and all courses are taught by CISCO Certified Academy Instructors (CCA).

CISN 490 Networking Helpdesk Practicum

Units: 3
Hours: 36 hours LEC; 54 hours LAB
Prerequisite: CIS 360, CISN 300, and CISN 304 with grades of "C" or better
Transferable: CSU
Catalog Date: January 1, 2022

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.

CISN 499 Experimental Offering in Computer Information Science - Networking

Units: 0.5 - 4
Prerequisite: None.
Transferable: CSU
Catalog Date: January 1, 2022

This is the experimental courses description.

Computer Information Science - Programming (CISP) Courses

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: AA/AS Area l(b)
Catalog Date: January 1, 2022

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.
CISP 310 Assembly Language Programming for Microcomputers

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.

CISP 350 Database Programming

This is an introductory course in programming databases. Topics include analysis and design, modular programming, screen displays and menus, and multiple databases.

CISP 351 Introduction to Relational Database Design and SQL

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.

CISP 352 Intermediate SQL

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.

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.

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.
## 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: | January 1, 2022 |

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.

## CISP 360 Introduction to Structured Programming

| Units: | 4 |
| Hours: | 54 hours LEC; 54 hours LAB |
| Prerequisite: | CISP 300 or MATH 400 with a grade of "C" or better, or placement through the assessment process. |
| Transferable: | CSU; UC |
| General Education: | AA/AS Area II(b) |
| C-ID: | C-ID COMP 112 |
| Catalog Date: | January 1, 2022 |

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.

## CISP 370 Beginning Visual Basic

| Units: | 4 |
| Hours: | 54 hours LEC; 54 hours LAB |
| Prerequisite: | None. |
| Advisory: | CISC 310 or CISP 300 |
| Transferable: | CSU; UC |
| General Education: | AA/AS Area II(b) |
| Catalog Date: | January 1, 2022 |

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.

## CISP 400 Object Oriented Programming with C++

| Units: | 4 |
| Hours: | 54 hours LEC; 54 hours LAB |
| Prerequisite: | CISP 360 with a grade of "C" or better |
| Transferable: | CSU; UC |
| General Education: | AA/AS Area II(b) |
| C-ID: | C-ID COMP 122 |
| Catalog Date: | January 1, 2022 |

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)

## 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: | January 1, 2022 |

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.

## 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: | January 1, 2022 |

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).
CISP 405 Object Oriented Programming using C# on Visual Studio .NET

Units: 4
Hours: 54 hours LEC; 54 hours LAB
Prerequisite: CISP 400 or 401 with a grade of "C" or better, or placement through the assessment process.
Transferable: CSU; UC
Catalog Date: January 1, 2022

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#.

CISP 430 Data Structures

Units: 4
Hours: 54 hours LEC; 54 hours LAB
Prerequisite: CISP 400 or CISP 401 with a grade of "C" or better or an equivalent level programming course in the programming language used in this course
Transferable: CSU; UC
C-ID: C-ID COMP 132
Catalog Date: January 1, 2022

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.

CISP 440 Discrete Structures for Computer Science

Units: 3
Hours: 54 hours LEC
Prerequisite: MATH 370 with a grade of "C" or better
Corequisite: CISP 430
Transferable: CSU; UC
C-ID: C-ID COMP 152
Catalog Date: January 1, 2022

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.

CISP 499 Experimental Offering in Computer Information Science - Programming

Units: 0.5 - 4
Prerequisite: None.
Transferable: CSU; UC (Credit for variable topics courses is given only after a review of the scope and content of the course by the enrolling UC campus.)
Catalog Date: January 1, 2022

This is the experimental courses description.

Computer Information Science - Security (CISS) Courses

CISS 300 Introduction to Information Systems Security

Units: 1
Hours: 18 hours LEC
Prerequisite: None.
Advisory: Some experience and/or coursework in networking.
Transferable: CSU
Catalog Date: January 1, 2022

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.

CISS 310 Network Security Fundamentals

Units: 3
Hours: 45 hours LEC; 27 hours LAB
Prerequisite: None.
Advisory: CISN 300 and 304 with grades of "C" or better
Transferable: CSU
Catalog Date: January 1, 2022

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,
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.

CISS 316 Cisco Networking Academy™: CCNA Cybersecurity Operations

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 students would be part of a team of people in Security Operations Centers (SOCs) 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.

CISS 321 Scripting for Cyber Security

This course is designed to cover tools that are commonly used by Information Security Professionals. Modern Operating Systems and scripting languages will be discussed as well as utilities and technologies that enable them. Topics including securing, hardening systems, incident response, automating tasks, auditing, and vulnerability assessment will be covered.


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.

CISS 350 Disaster Recovery

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.

CISS 353 Management of Information Security

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.
This course focuses on the managerial aspects of information security and assurance. Topics covered include project management, access control models, information security governance, and information security program assessment and metrics. Coverage on the foundational and technical components of information security is included to reinforce key concepts.

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
- **Transferable:** CSU
- **Catalog Date:** January 1, 2022

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.

Computer Information Science - Web (CISW) Courses

CISW 300 Web Publishing

- **Units:** 3
- **Hours:** 54 hours LEC
- **Prerequisite:** None.
- **Transferable:** CSU
- **Catalog Date:** January 1, 2022

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.

CISW 304 Cascading Style Sheets

- **Units:** 2
- **Hours:** 27 hours LEC; 27 hours LAB
- **Prerequisite:** CISW 300 with a grade of "C" or better
- **Transferable:** CSU
- **Catalog Date:** January 1, 2022

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).

CISW 308 Mobile Web Development

- **Units:** 2
- **Hours:** 27 hours LEC; 27 hours LAB
- **Prerequisite:** CISW 300 with a grade of "C" or better
- **Advisory:** CISW 304
- **Transferable:** CSU
- **Catalog Date:** January 1, 2022

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.

CISW 310 Advanced Web Publishing

- **Units:** 4
- **Hours:** 72 hours LEC
- **Prerequisite:** CISW 300 with a grade of "C" or better
- **Transferable:** CSU
- **Catalog Date:** January 1, 2022

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.

CISW 321 Web Site Development using Dreamweaver

- **Units:** 3
- **Hours:** 54 hours LEC
- **Prerequisite:** None.
- **Advisory:** CISC 305
- **Transferable:** CSU
- **Catalog Date:** January 1, 2022

This course covers the use of Dreamweaver, a visual Web-authoring tool, to develop and implement Web sites. The topics covered include creating Web pages that contain text, images,
links, tables, frames, forms, Cascading Style Sheets and image maps, as well as enhancing Web pages Flash elements and built-in scripting. Additional topics include developing effective Web site structures, using Web site management tools, Web site documentation, making global updates to a Web site, and extending Dreamweaver. Students will work individually and as a member of a team to plan, implement, test, and evaluate Web sites.

CISW 326 Intermediate Web Site Development using Dreamweaver

Units: 3
Hours: 54 hours LEC
Prerequisite: CISW 321 with a grade of “C” or better
Transferable: CSU
Catalog Date: January 1, 2022

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.

CISW 350 Imaging for the Web

Units: 1
Hours: 18 hours LEC
Prerequisite: None.
Advisory: CISC 306 and CISW 300
Transferable: CSU
Catalog Date: January 1, 2022

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.

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: January 1, 2022

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.

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: January 1, 2022

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.

CISW 402 Intermediate JavaScript

Units: 2
Hours: 27 hours LEC; 27 hours LAB
Prerequisite: CISW 400 with a grade of “C” or better
Advisory: CISW 410
Transferable: CSU
Catalog Date: January 1, 2022

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.

CISW 410 Middleware Web Scripting

Units: 4
Hours: 72 hours LEC
Prerequisite: CISW 300 with a grade of “C” or better
Advisory: CISP 300 or CISW 310
Transferable: CSU
Catalog Date: January 1, 2022

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
CISW 440 XML: Introduction to Extensible Markup Language

| Units:     | 2 |
| Hours:     | 36 hours LEC |
| Prerequisite: | CISW 300 with a grade of "C" or better |
| Advisory:  | CISA 320 or CISP 350 |
| Transferable: | CSU |
| Catalog Date: | January 1, 2022 |

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.

CISW 499 Experimental Offering in Computer Information Science - Web

| Units:     | 0.5 - 4 |
| Prerequisite: | None. |
| Transferable: | CSU |
| Catalog Date: | January 1, 2022 |

This is the experimental courses description.