

# CIS 053: COMPUTER NETWORKS AND SECURITY

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**Originator**

Felix Marhuenda-Donate

**Justification / Rationale**

Adding C-ID in correct place. See T.A.

**Effective Term**

Fall 2023

**Credit Status**

Credit - Degree Applicable

**Subject**

CIS - Computer Information Systems

**Course Number**

053

**Full Course Title**

Computer Networks and Security

**Short Title**

COMPTIA NETWORK+

**Discipline****Disciplines List**

Computer Information Systems (Computer network installation, microcomputer technology, computer applications)

**Modality**

Face-to-Face

100% Online

Hybrid

**Catalog Description**

This course ensures a student has the knowledge and skill to design and implement functional networks, configure, manage and maintain essential network devices, use devices such as switches and routers to segment network traffic and create resilient networks, identify benefits and drawbacks of existing network configurations, implement network security, standards, and protocols, troubleshoot network problems, support the creation of virtualized networks. Successful completion of this course prepares the student to take the CompTIA Network+ N10-008 certification exam. C-ID: ITIS 150

**Schedule Description**

This course explains the purpose of a variety of networking concepts and implements them appropriately; it determines and explains the appropriate cabling, device and storage technologies for your infrastructure; use the best practices to manage the network, determine policies and ensure business continuity; summarizes physical security and common attacks while securing the wired and wireless network; explains the network troubleshooting methodology and appropriate tools to support connectivity and performance. Successful completion of this course prepares the student to take the CompTIA Network+ N10-008 certification exam.

**Lecture Units**

2

**Lecture Semester Hours**

36

**Lab Units**

1

**Lab Semester Hours**

54

**In-class Hours**

90

**Out-of-class Hours**

72

**Total Course Units**

3

**Total Semester Hours**

162

**Required Text and Other Instructional Materials****Resource Type**

Web/Other

**Open Educational Resource**

No

**Year**

2021

**Description**TestOut Network Pro Courseware <https://w3.testout.com/courses/network-pro>

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**Resource Type**

Web/Other

**Open Educational Resource**

No

**Year**

2021

**Description**

Online resources integrated with the e-textbook including online virtual computer labs which allow students to practice, explore and try different solutions using real Cisco hardware and virtualized Windows, Linux and UNIX operating systems.

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**Class Size Maximum**

35

**Course Content**

## 1.0 Network Concepts

- Explain the purposes and uses of ports and protocols
- Explain devices, applications, protocols, and services at their appropriate OSI layers
- Explain the concepts and characteristics of routing and switching
- Given a scenario, configure the appropriate IP addressing components
- Compare and contrast the characteristics of network topologies, types, and technologies
- Given a scenario, implement the appropriate wireless technologies and configurations
- Summarize cloud concepts and their purposes
- Explain the functions of network services

## 2.0 Infrastructure

- Given a scenario, deploy the appropriate cabling solution
- Given a scenario determine the appropriate placement of networking devices on a network and install/configure them
- Explain the purposes and use cases for advanced networking devices
- Explain the purposes of virtualization and network storage technologies
- Compare and contrast Wide Area Network (WAN) technologies

## 3.0 Network Operations

- Given a scenario, use appropriate documentation and diagrams to manage the network
- Compare and contrast business continuity and disaster recovery concepts
- Explain common scanning, monitoring, and patching processes and summarize their expected outputs
- Given a scenario, use remote access methods
- Identify policies and best practices

#### 4.0 Network Security

- Summarize the purposes of physical security devices
- Explain authentication and access control
- Given a scenario, secure a basic wireless network
- Summarize common networking attacks
- Given a scenario, implement network device hardening
- Explain common mitigation techniques and their purposes

#### 5.0 Network Troubleshooting

- Explain the network troubleshooting methodology
- Given a scenario, use the appropriate tools
- Given a scenario, troubleshoot common wired connectivity and performance issues
- Given a scenario, troubleshoot common wireless connectivity and performance
- Given a scenario, troubleshoot common network issues

### Lab Content

1. Router and Switch configuration
  - a. Global configuration
  - b. Configuring ports
  - c. Configuring interfaces
    - i. IPv4 (Internet Protocol version 4)
    - ii. IPv6 Internet Protocol version 6)
  - d. Configuring protocols
    - i. IPv4 (Internet Protocol version 4)
    - ii. IPv6 (Internet Protocol version 6)
  - e. Configuring services
    - i. IPv4 (Internet Protocol version 4)
    - ii. IPv6 Internet Protocol version 6)
  - f. ACLs (Access Control Lists)
2. DNS
  - a. IPv4 (Internet Protocol version 4)
    - i. Server configuration
    - ii. Client configuration
  - b. IPv6 Internet Protocol version 6)
    - i. Server configuration
    - ii. Client configuration
3. DHCP
  - a. IPv4 (Internet Protocol version 4) configuration
  - b. IPv6 (Internet Protocol v 6) configuration
4. Copper Cables
  - a. Media and connector selector
  - b. Assembling UTP (Unshielded Twisted Pair) cables
  - c. Testing UTP Unshielded Twisted Pair) cables
5. Configure WAP (Wireless Access Point)
  - a. Physical location consideration
  - b. SSID (Server Set Identifier)
  - c. Channels
  - d. Security
6. Troubleshooting connectivity issues
  - a. Hardware tools
  - b. Software tools
7. Network monitoring, performance, and troubleshooting tools
  - a. Wireshark
  - b. Syslog (System Log)
  - c. SNMP (Simple Network Protocol)
  - d. Netflow
8. Installation and configuration of firewall
  - a. Host-based

- b. Network-based
- 9. Network Appliance installation and configuration
  - a. Intrusion Detection System (IDS)
  - b. Intrusion Prevention System (IPS)
- 10. Network security
  - a. Threat vulnerability identification
  - b. Vulnerability mitigation
- 11. PowerShell
  - a. Basic PowerShell
  - b. Scripting for networks

### Course Objectives

Objectives	
Objective 1	Explain the purposes and uses of ports and protocols. (Networking Concepts)
Objective 2	Explain devices, applications, protocols, and services at their appropriate OSI (Open System Interconnection) layers. (Networking Concepts)
Objective 3	Explain the concepts and characteristics of routing and switching. (Networking Concepts)
Objective 4	Given a scenario, configure the appropriate IP (Internet Protocol) addressing components. (Networking Concepts)
Objective 5	Given a scenario, implement the appropriate wireless technologies and configurations. (Networking Concepts)
Objective 6	Summarize cloud concepts and their purposes. (Networking Concepts)
Objective 7	Explain the functions of network services. (Networking Concepts)
Objective 8	Given a scenario, deploy the appropriate cabling solution. (Infrastructure)
Objective 9	Given a scenario, determine the appropriate placement of networking devices on a network and install/configure them. (Infrastructure)
Objective 10	Explain the purposes and use cases for advanced networking devices. (Infrastructure)
Objective 11	Explain the purposes of virtualization and network storage technologies. (Infrastructure)
Objective 12	Compare and contrast WAN (Wide Area Network) technologies. (Infrastructure)
Objective 13	Given a scenario, use appropriate documentation and diagrams to manage the network. (Network Operations)
Objective 14	Compare and contrast business continuity and disaster recovery concepts. (Network Operations)
Objective 15	Explain common scanning, monitoring and patching processes and summarize their expected outputs. (Network Operations)
Objective 16	Given a scenario, use remote access methods. (Network Operations)
Objective 17	Identify policies and best practices. (Network Operations)
Objective 18	Summarize the purposes of physical security devices. (Network Security)
Objective 19	Explain authentication and access controls. (Network Security)
Objective 20	Given a scenario, secure a basic wireless network. (Network Security)
Objective 21	Summarize common networking attacks. (Network Security)
Objective 22	Given a scenario, implement network device hardening. (Network Security)
Objective 23	Explain common mitigation techniques and their purposes. (Network Security)
Objective 24	Explain the network troubleshooting methodology. (Network Troubleshooting & Tools)
Objective 25	Given a scenario, use the appropriate tool. (Network Troubleshooting & Tools)
Objective 26	Given a scenario, troubleshoot common wired connectivity and performance issues. (Network Troubleshooting & Tools)
Objective 27	Given a scenario, troubleshoot common wireless connectivity and performance issues. (Network Troubleshooting & Tools)
Objective 28	Given a scenario, troubleshoot common network service issues. (Network Troubleshooting & Tools)

### Student Learning Outcomes

Upon satisfactory completion of this course, students will be able to:	
Outcome 1	Describe the devices, services, applications and protocols used to support communications in data networks and the Internet.

Outcome 2 Apply appropriate solutions to simulated network issues.

Outcome 3 Implement established and standard network designs and protocols.

### Methods of Instruction

Method	Please provide a description or examples of how each instructional method will be used in this course.
Lecture	Example: Lectures to introduce and clarify the fundamental concepts of routing, IP addressing IPv4 and IPv6, OSI model, cabling, and routing fundamentals.
Collaborative/Team	Example: Collaborative projects / cooperative learning tasks in small groups in order to encourage students to develop and apply collaboration skills.
Activity	Example: Create IPv4 VLANs (Virtual Local Area Networks). Example: Use Wireshark to examine ethernet frames and to verify a secure FTP connection.
Technology-based instruction	Examples: Videos/films/slides/audio tapes to demonstrate LANs (Local Area Networks)/WANs (Wide Area Networks).
Other (Specify)	Examples: Projects to demonstrate the acquisition of skills required to relate the OSI model to router and switch configurations and communication.
Laboratory	Examples: Continuing work throughout the course using hands-on (classroom) and virtual computing devices and software.

### Methods of Evaluation

Method	Please provide a description or examples of how each evaluation method will be used in this course.	Type of Assignment
Written homework	Example: Subnet a given network using VSLM (Variable Length Subnet Mask) addressing scheme.	In and Out of Class
Student participation/contribution	Example: Given a particular scenario, students describe to the class steps taken to troubleshoot the issue(s).	In Class Only
Mid-term and final evaluations	Final examination and skills evaluation of student's knowledge of all Domains and Objectives of the CompTIA Network+ Certification Exam N10-008.	In Class Only
Tests/Quizzes/Examinations	Examples: Weekly quizzes designed to assess students' mastery of the materials covered in previous week(s).	In Class Only
Group activity participation/observation	Example: Class and individual projects such as creating an addressing scheme for a proposed local network.	In and Out of Class
Presentations/student demonstration observations	Examples: Hands-on-projects and a combination of presentations, discussions, or problem-solving assignments. Presentations of projects within specific modules.	In Class Only
Computational/problem-solving evaluations	Example: Given a scenario, diagnose network connections using appropriate software and hardware.	In and Out of Class
Laboratory projects	Example: Various projects throughout the course using hands-on and online virtual computing devices and software.  Approximately 47 online labs on various topics and complexity are used during the course, in addition to hands-on laboratory projects.	In and Out of Class

### Assignments

### Other In-class Assignments

- Building a Simple Network
- Configuring a Switch Management Address
- Using Wireshark to View Network Traffic
- Using Wireshark to Examine Ethernet Frames
- Viewing Network Device MAC Addresses
- Viewing the Switch MAC (Media Access Control) Address Table
- Exploring Router Physical Characteristics
- Building a Switch and Router Network
- Identifying IPv6 Addresses
- Configuring IPv6 Addresses on Network Devices
- Testing Network Connectivity with Ping and Traceroute
- Designing and Implementing a Subnetted IPv4 Addressing Scheme
- Designing and Implementing a VLSM (Variable Length Subnet Mask) Addressing Scheme
- Accessing Network Devices with SSH (Secure Shell Protocol)
- Securing Network Devices
- Managing Router Configuration Files with Terminal Emulation Software
- Managing Device Configuration Files Using TFTP (Trivial File Transfer Protocol) Flash and USB
- Observing ARP with the Windows CLI (Command Line Interface), IOS (iPhone Operating System) CLI, and Wireshark
- Initializing and Reloading a Router and Switch
- Installing the IPv6 Protocol with Windows OS
- Configuring a Switch Management Address
- Using IOS (iPhone Operating System) CLI (Command Line Interface) with Switch MAC (Media Access Control) Address Tables
- Securing Network Devices
- Using the CLI (Command Line Interface) to Gather Network Device Information

### Other Out-of-class Assignments

Students will be given case-based assignments involving web research, technical manuals, and general textbook reading regarding the various topics covered in the course.

#### Example 1:

Given a certain Class A network and subnet mask, subnet the network into eight subnets, giving for each the Network ID, First Valid Address, Last Valid address, and Broadcast address

#### Example 2:

Setup and configure VLANs in IPv4 with the following devices:

Cisco 1841 Router

Cisco 2960 Switch

Set up and configure the IP (Internet Protocol) addresses, DHCP (Dynamic Host Configuration Protocol), subnet masks, and default gateways for three VLANs, and the TCP/IP Transmission Control Protocol/Internet Protocol settings for the router and two printers for a specified network design.

### Grade Methods

Letter Grade Only

### Distance Education Checklist

Include the percentage of online and on-campus instruction you anticipate.

### Lab Courses

#### How will the lab component of your course be differentiated from the lecture component of the course?

The lab component of this course is identical for both face-to-face and online students. The online labs provide students the opportunity to use real Cisco hardware and Windows and Linux operating systems in a virtualized environment which accurately simulates the hands-on use of such hardware and software.

The lecture portion of the course for online students will be delivered via annotated PowerPoint presentations, videos and written descriptions of the materials being covered each week throughout the semester.

**From the COR list, what activities are specified as lab, and how will those be monitored by the instructor?**

As described above, online, web-based resources integrated with TestOut include virtual computer labs that will allow students to practice, explore and try different solutions using real Cisco hardware and virtualized Windows and Linux operating systems. The integrated TestOut software provides the instructor with the ability to monitor when students have accessed the labs, the time(s) spent on them and their on-going progress, in addition to the final results of their work.

**How will you assess the online delivery of lab activities?**

The results of student work on the online labs are integrated into the LMS in real time. This means that as students complete the assigned labs, their score is ported to the gradebook in Canvas. As stated above, the integrated e-materials provide the instructor with the ability to monitor, when students have accessed the labs, the time(s) spent on them and their on-going progress in addition to the final results of their work.

**Instructional Materials and Resources****If you use any other technologies in addition to the college LMS, what other technologies will you use and how are you ensuring student data security?**

The TestOut lab simulations of computer networks are accessible to students through Canvas from which they will connect to the TestOut exercises integrated with the e-Book materials. This is the same procedure which face-to-face students use to access these labs.

**If used, explain how specific materials and resources outside the LMS will be used to enhance student learning.**

As described above, the TestOut virtualized hardware and software exercises provide a substitute for hands-on work with hardware when in working with servers and networking devices. These simulations will give students the "hands on" experience they need to be successful in class, obtaining their CompTIA Network+ Certification (if they so desire) and in finding or enhancing a career in the IT field.

**Effective Student/Faculty Contact****Which of the following methods of regular, timely, and effective student/faculty contact will be used in this course?****Within Course Management System:**

- Chat room/instant messaging
- Discussion forums with substantive instructor participation
- Online quizzes and examinations
- Private messages
- Regular virtual office hours
- Timely feedback and return of student work as specified in the syllabus
- Video or audio feedback
- Weekly announcements

**External to Course Management System:**

- Direct e-mail
- Posted audio/video (including YouTube, 3cm mediasolutions, etc.)
- Synchronous audio/video
- Teleconferencing

**Briefly discuss how the selected strategies above will be used to maintain Regular Effective Contact in the course.**

Taken together, the strategies, used on a weekly or more frequent basis will ensure that there will be multiple ongoing contacts with students. Some examples:

- \* Announcements of upcoming topics, comments on (overall) class achievements, answers to general questions, etc., sent more frequently than weekly provide regular communication with the class.
- \* Occasional or weekly discussions, with substantial instructor feedback, will provide an opportunity for individualized assessment of students' understanding.
- \* Regular weekly quizzes and occasional homework assignments provide another regular opportunity to gauge individual student understanding and progress and to provide video, audio or email feedback to the students.
- \* Labs are assigned weekly; many times multiple labs are required in each week. As described above, this work is easily monitored by the instructor and provides multiple opportunities to interact individually with the students throughout the semester.

## Other Information

### Comparable Transfer Course Information

**University System**

CSU

**Campus**

CSU San Bernardino

**Course Number**

IST 2210

**Course Title**

Computer Networks and Security

**Catalog Year**

2020-2021

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## MIS Course Data

**CIP Code**

11.0901 - Computer Systems Networking and Telecommunications.

**TOP Code**

070810 - Computer Networking

**SAM Code**

C - Clearly Occupational

**Basic Skills Status**

Not Basic Skills

**Prior College Level**

Not applicable

**Cooperative Work Experience**

Not a Coop Course

**Course Classification Status**

Credit Course

**Approved Special Class**

Not special class

**Noncredit Category**

Not Applicable, Credit Course

**Funding Agency Category**

Not Applicable

**Program Status**

Program Applicable

**Transfer Status**

Transferable to CSU only

**General Education Status**

Y = Not applicable

**Support Course Status**

N = Course is not a support course



**C-ID**

ITIS 150

**Allow Audit**

Yes

**Repeatability**

No

**Materials Fee**

No

**Additional Fees?**

No

**Files Uploaded****Attach relevant documents (example: Advisory Committee or Department Minutes)**

CIS 053 Approval Letter.pdf

CompTIA-Network+ N10-007-Exam-Objectives.pdf

**Approvals****Curriculum Committee Approval Date**

10/04/2022

**Academic Senate Approval Date**

10/13/2022

**Board of Trustees Approval Date**

11/10/2022

**Chancellor's Office Approval Date**

11/21/2022

**Course Control Number**

CCC000634447

**Programs referencing this course**Computer Information Systems Associate of Science and Transfer Preparation (<http://catalog.collegeofthedesert.eduundefined/?key=221>)Liberal Arts: Business and Technology AA Degree (<http://catalog.collegeofthedesert.eduundefined/?key=27>)Information Technology Specialist Certificate of Achievement (<http://catalog.collegeofthedesert.eduundefined/?key=312>)Cyber Security Specialist (<http://catalog.collegeofthedesert.eduundefined/?key=316>)Computer Information Systems Associate of Science (<http://catalog.collegeofthedesert.eduundefined/?key=323>)Computer Information Systems AS Degree for Employment Preparation (<http://catalog.collegeofthedesert.eduundefined/?key=61>)