

CIS 053: COMPUTER NETWORK FUNDAMENTALS

Originator

fmarhuenda

Justification / Rationale

Exchange one lecture unit for one lab unit. The contact hours are simply not enough to deliver the content. We taught this course for the first time this past academic year. It's part of the process of improvement.

Add Advisory: CIS 040 or CIS 340B

Effective Term

Fall 2019

Credit Status

Credit - Degree Applicable

Subject

CIS - Computer Information Systems

Course Number

053

Full Course Title

Computer Network Fundamentals

Short Title

IT NETWORKS

Discipline**Disciplines List**

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

Modality

Face-to-Face

100% Online

Catalog Description

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

Schedule Description

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Advisory: CIS 040 or CIS 340B

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

Prerequisite Course(s)

Advisory: CIS 040 or CIS 340B

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

Book

Author

Meyers, Mike

Title

CompTIA Network+ All-In-One Exam Guide

Edition

7th

Publisher

McGraw Hill

Year

2018

College Level

Yes

Flesch-Kincaid Level

11

ISBN #

9781260122381

Class Size Maximum

32

Entrance Skills

Classify and identify the necessary equipment to effectively manage a network environment and perform security forensics.

Prerequisite Course Objectives

CIS 040-Understand the basics of networking and security/forensics.

CIS 040-Properly and safely diagnose, resolve and document common hardware and software issues while applying troubleshooting skills.

CIS 040-Understand the basics of virtualization, desktop imaging, and deployment.

CIS 340B-Properly and safely diagnose, resolve and document common hardware and software issues while applying troubleshooting skills.

CIS 340B-Provide appropriate customer support.

CIS 340B-Understand the basics of virtualization, desktop imaging, and deployment.

Course Content

1. OSI (Open Systems Interconnection)
 - a. How the layers prepares network packets for transmission.
 - b. Description of the encapsulation protocols and processes.
 - c. Network layer routing.
2. TCP/IP (Transmission Control Protocol/Internet Protocol) layered models.
 - a. Explore how TCP uses segmentation.
 - b. Differences between the OSI and TCP/IP model.
 - c. Functions included in the Internet layer.
3. IP addressing (IPv4).
 - a. Break down the different classes of IP addresses.
 - b. Subnetting IPv4 addresses.
 - c. Improve network performance by subnetting.
4. IP addressing (IPv6)
 - a. IPv6 Prefix length.
 - b. IPv6 Unicast addresses.
 - c. Link-local addresses.
 - d. Unique local addresses.
5. Routing.
 - a. Set password on VTY lines.
 - b. Set IP addresses on router interfaces.
 - c. Set the clock rate on serial interfaces.
6. Functions of common networking protocols.
 - a. How protocols allow communication to occur.
 - b. Functions of User Datagram protocol (UDP).
 - c. Acknowledgements to ensure delivery of IP packets.
7. DNS (Domain Name System).
 - a. Resolving a DNS name.
 - b. Hierarchical DNS servers.
8. Network troubleshooting methodology.
 - a. Using the OSI model in troubleshooting.
 - b. Protocol analysis of a small network.
9. Installation and configuration of routers and switches for a given scenario.
 - a. Implement Vlan's.
 - b. Set the management Vlan on switches.
 - c. Configure router interfaces
10. Installation and configuration of a wireless network for a given scenario.
 - a. Set passwords.
 - b. Set DHCP (Dynamic Host Configuration Protocol).
 - c. Set encryption to AES and security mode to WPA2 personal.
11. DHCP.
 - a. Set maximum number of users.
 - b. Change the client lease time.
12. Planning and implementation of a basic SOHO (Small Office/Home Office) network for a given set of requirements.
 - a. Network security and performance.
 - b. Developing IP and subnets maps.
13. Standard media types (for example: Fiber, Copper), associated properties, standard connector types.
14. Wireless standards.
 - a. WPA personal.
 - b. WPA enterprise.
 - c. Disable SSID Broadcast.
15. WAN (Wide Area Networks) technology types and properties.
 - a. ISDN.
 - b. DSL.
 - c. Frame Relay.
16. Network topologies.

- a. Define star topologies.
 - b. Client server.
 - c. Ring topologies.
17. LAN (Local Area Networks) technology types and properties.
 - a. Logical map of the network.
 - b. Physical map of the network.
 - c. Vlan,s mapped to IP addresses.
 18. Hardware and software tools to troubleshoot connectivity issues.
 - a. Extended ping.
 - b. Network baseline testing.
 - c. Protocol analyzer.
 19. Network monitoring resources to analyze traffic.
 - a. Using WireShark to watch network performance.
 - b. Using Protocol Analyzer.
 20. Network performance optimization.
 - a. Using Vlan's.
 - b. Providing file-sharing services.
 - c. Interpreting ping results.
 21. Wireless Security Measures.
 - a. AES encryption.
 - b. WPA personal.
 - c. Disable SSID broadcast.
 22. Network Access Security Methods.
 - a. Control VTY lines.
 - b. Control Telnet.
 23. User authentication Methods.
 - a. Security on VTY lines.
 - b. Authentication using SSH.
 - c. Encryption of passwords.
 24. Common threats, vulnerabilities, and mitigation techniques.
 - a. Firewalls.
 - b. Endpoint security.
 - c. Authentication, authorization, and accounting.

Lab Content

1. Router and Switch configuration
 - a. Global configuration
 - b. Configuring ports
 - c. Configuring interfaces
 - i. IPv4
 - ii. IPv6
 - d. Configuring protocols
 - i. IPv4
 - ii. IPv6
 - e. Configuring services
 - i. IPv4
 - ii. IPv6
 - f. ACLs Access Control Lists)
2. DNS
 - a. IPv4
 - i. Server confirguration
 - ii. Client configuration
 - b. IPv6
 - i. Server configuration
 - ii. Client configuration
3. DHCP
 - a. IPv4 configuration
 - b. IPv6 configuration
4. Copper Cables
 - a. Media and connector selector
 - b. Assembling UTP cables

- c. Teting UTP 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
 - c. SNMP
 - 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 | Describe and differentiate the devices and services used to support communications in data networks and the Internet. |
| Objective 2 | Describe the role of protocol layers in data networks. |
| Objective 3 | Evaluate the importance of addressing and naming schemes at various layers of data networks in IPv4 and IPv6 environments. |
| Objective 4 | Design, calculate, and apply subnet masks and addresses to fulfill given requirements in IPv4 and IPv6 networks. |
| Objective 5 | Explain fundamental Ethernet concepts such as media, services, and operations. |
| Objective 6 | Build a simple Ethernet network using routers and switches. |
| Objective 7 | Compose Cisco command-line interface (CLI) commands to perform basic router and switch configurations. |
| Objective 8 | Experiment with common network utilities to verify small network operations and analyze data traffic. |

Student Learning Outcomes

| | Upon satisfactory completion of this course, students will be able to: |
|-----------|---|
| Outcome 1 | Describe and differentiate the devices and services used to support communications in data networks and the Internet. |
| Outcome 2 | Evaluate sensible solutions in simulated network issues. |
| Outcome 3 | Implement established and successful 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. |
|------------------------------------|---|
| Demonstration, Repetition/Practice | Presentation of class lectures/discussions/demonstrations in order to model and explain the fundamental concepts of routing, IP addressing IPv4 and IPv6, OSI model, cabling, and routing fundamentals. |
| Collaborative/Team | Collaborative projects/cooperative learning tasks in order to encourage students to develop and apply networking skills. |
| Activity | Activities to address areas of improvement in the fundamental concepts of Cisco networking to establish network communications |
| Technology-based instruction | Use of simulations and other IT equipment. |

| | |
|-----------------|---|
| Lecture | Presentation of class lectures/discussions/demonstrations in order to clarify the principles of TCP/IP protocol suite and IPv4 and IPv6 addressing. |
| Other (Specify) | Projects in order to facilitate and demonstrate the acquisition of skills required to relate the OSI model to router and switch commutations. |

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 | Written on-line assignments; these topics are called out in the CISCO curriculum. | In and Out of Class |
| Student participation/contribution | Students will describe to the class steps taken to troubleshoot issues. | In Class Only |
| Mid-term and final evaluations | Final examination/skills assessment administered on the CISCO site. | In and Out of Class |
| Tests/Quizzes/Examinations | Testing of each module on the CISCO website. | Out of Class Only |
| Group activity participation/observation | Class and individual projects such as an addressing scheme for a proposed local network. | In and Out of Class |
| Presentations/student demonstration observations | Hands-on-projects and a combination of examinations, presentations, discussions, or problem-solving assignments. Presentations of projects within specific modules. | In Class Only |
| Computational/problem-solving evaluations | Diagnose network connections using appropriate software. | In and Out of Class |
| Laboratory projects | Laboratory projects/performance within Netlab, a locally hosted network simulator. | 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 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 Addressing Scheme
- Accessing Network Devices with SSH
- Securing Network Devices
- Managing Router Configuration Files with Terminal Emulation Software
- Managing Device Configuration Files Using TFTP Flash and USB
- Observing ARP with the Windows CLI IOS CLI and Wireshark
- Initializing and Reloading a Router and Switch
- Installing the IPv6 Protocol with Windows OS
- Building a Simple Network
- Configuring a Switch Management Address
- Using Wireshark to View Network Traffic
- 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 Addressing Scheme
- Viewing Network Device MAC Addresses
- Using Wireshark to Examine Ethernet Frames
- Observing ARP with the Windows CLI, IOS CLI, and Wireshark
- Using IOS CLI with Switch MAC Address Tables
- Accessing Network Devices with SSH
- Securing Network Devices
- Using the CLI to Gather Network Device Information
- Managing Router Configuration Files with Terminal Emulation Software
- Managing Device Configuration Files Using TFTP, Flash, and USB

Other Out-of-class Assignments

- Students are required to read the Cisco Netacad Web site and the CCNA Routing and Switching Introduction to Networks Companion Guide booklet.
- Utilizing the concepts learned, students will write a paper clarifying the (OSI) Open System Interconnect model on how each layer is used and aligning protocols to each layer. Students will also write a list IP addresses used to subnet a class A, B, and C network.
- Students will be completing assignments outside of class utilizing Packet Tracer, NetAcad, and Netlab. These assignments will consist of preset configuration requirements covering different router and switch networking scenarios.

Grade Methods

Letter Grade Only

Distance Education Checklist

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?

We will be using NetLab to conduct lab simulations of computer networks. NetLab for Southern California will be hosted similarly to the one from Northern California, at a local CCC. Students will log in through Canvas and proceed to NetLab from there.

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

NetLab contains simulations of computer networks and configurations. These simulations will give students the "hands on" experience they need to be successful in the class and in finding a career.

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:

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

External to Course Management System:

Direct e-mail
Teleconferencing

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

There will be weekly discussions regarding topics related to the course with appropriate instructor participation. Students will create logs describing the process to diagnose an issue. These logs are uploaded to the LMS and receive appropriate instructor feedback.

If interacting with students outside the LMS, explain how additional interactions with students outside the LMS will enhance student learning.

As described above, NetLab provides a substitute for the hand-on with hardware that f2f courses have when dealing with servers and appliances.

Online Course Enrollment

Maximum enrollment for online sections of this course

32

Other Information

Comparable Transfer Course Information

University System

CSU

Campus

CSU San Bernardino

Course Number

IST 275

Course Title

Information Networking and Security

Catalog Year

2016-2017

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

Allow Audit

No

Repeatability

No

Materials Fee

No

Additional Fees?

No

Files Uploaded

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

CIS 053 Approval Letter.pdf

Approvals**Curriculum Committee Approval Date**

10/18/2018

Academic Senate Approval Date

10/25/2018

Board of Trustees Approval Date

11/14/2018

Chancellor's Office Approval Date

11/22/2018

Course Control Number

CCC000598704

Programs referencing this course

Computer Information Systems Certificate of Achievement (<http://catalog.collegeofthedesert.eduundefined?key=122>)

Computer Information Systems Associate of Science and Transfer Preparation (<http://catalog.collegeofthedesert.eduundefined?key=221>)

Computer Information Systems AS Degree for Employment Preparation (<http://catalog.collegeofthedesert.eduundefined?key=61>)