Virginia Western Community College
ITN 154
Introduction to Networks - Cisco

Prerequisites
none

Course Description
Provides instruction in the fundamentals of networking environments, the basics of router operations, and basic router and switch configuration.

Semester Credits: 4   Lecture Hours: 3   Lab/Clinical/Internship Hours: 2

Required Materials

Textbook:
CCNA Portable Command Guide, Authors: Scott Empson, 5th ed. ISBN: 978-0135937822.
Primary reading material is located on netacad.com

Other Required Materials:
Packet Tracer Software (available from the class website)

Course Outcomes

At the completion of this course, the student should be able to:

- Explain the advances in modern network technologies.
- Implement initial settings including passwords, IP addressing, and default gateway parameters on a network switch and end devices.
- Explain how network protocols enable devices to access local and remote network resources.
- Explain how physical layer protocols, services, and network media support communications across data networks.
- Calculate numbers between decimal, binary, and hexadecimal systems.
- Explain how media access control in the data link layer supports communication across networks.
- Explain how Ethernet operates in a switched network.
- Explain how routers use network layer protocols and services to enable end-to-end connectivity.
- Explain how ARP and ND enable communication on a network.
- Implement initial settings on a router and end devices.
- Calculate an IPv4 subnetting scheme to efficiently segment a network.
- Implement an IPv6 addressing scheme.
- Use various tools to test network connectivity.
- Compare the operations of transport layer protocols in supporting end-to-end communication.

- Explain the operation of application layer protocols in providing support to end-user applications.
- Configure switches and routers with device hardening features to enhance security.
- Implement a network design for a small network to include a router, a switch, and end devices.

ADA Statement (PDF)
Title IX Statement (PDF)

Topical Description

CCNAv7: ITN		
Module	**Topic**	**Objective**
Networking Today		Explain the advances in modern network technologies.
	Networks Affect Our Lives	Explain how networks affect our daily lives.
	Network Components	Explain how host and network devices are used.
	Network Representations and Topologies	Explain network representations and how they are used in network topologies.
	Common Types of Networks	Compare the characteristics of common types of networks.
	Internet Connections	Explain how LANs and WANs interconnect to the internet.
	Reliable Networks	Describe the four basic requirements of a reliable network.
	Network Trends	Explain how trends such as BYOD, online collaboration, video, and cloud computing are changing the way we interact.
	Network Security	Identify some basic security threats and solutions for all networks.
	The IT Professional	Explain employment opportunities in the networking field.
Module	**Topic**	**Objective**
Basic Switch and End Device Configuration		Implement initial settings including passwords, IP addressing, and default gateway parameters on a network switch and end devices.
	Cisco IOS Access	Explain how to access a Cisco IOS device for configuration purposes.
	IOS Navigation	Explain how to navigate Cisco IOS to configure network devices.
	The Command Structure	Describe the command structure of Cisco IOS software.
	Basic Device Configuration	Configure a Cisco IOS device using CLI.

	Save Configurations	Use IOS commands to save the running configuration.
	Ports and Addresses	Explain how devices communicate across network media.
	Configure IP Addressing	Configure a host device with an IP address.
	Verify Connectivity	Verify connectivity between two end devices.
Module	**Topic**	**Objective**
Protocols and Models		Explain how network protocols enable devices to access local and remote network resources.
	The Rules	Describe the types of rules that are necessary to successfully communicate.
	Protocols	Explain why protocols are necessary in network communication.
	Protocol Suites	Explain the purpose of adhering to a protocol suite.
	Standards Organizations	Explain the role of standards organizations in establishing protocols for network interoperability.
	Reference Models	Explain how the TCP/IP model and the OSI model are used to facilitate standardization in the communication process.
	Data Encapsulation	Explain how data encapsulation allows data to be transported across the network.
	Data Access	Explain how local hosts access local resources on a network.
Module	**Topic**	**Objective**
Physical Layer		Explain how physical layer protocols, services, and network media support communications across data networks.
	Purpose of the Physical Layer	Describe the purpose and functions of the physical layer in the network.
	Physical Layer Characteristics	Describe characteristics of the physical layer.

	Copper Cabling	Identify the basic characteristics of copper cabling.
	UTP Cabling	Explain how UTP cable is used in Ethernet networks.
	Fiber-Optic Cabling	Describe fiber-optic cabling and its main advantages over other media.
	Wireless Media	Connect devices using wired and wireless media.

Module	Topic	Objective
Number Systems		Calculate numbers between decimal, binary, and hexadecimal systems.
	Binary Number System	Calculate numbers between decimal and binary systems.
	Hexadecimal Number System	Calculate numbers between decimal and hexadecimal systems.

Module	Topic	Objective
Data Link Layer		Explain how media access control in the data link layer supports communication across networks.
	Purpose of the Data Link Layer	Describe the purpose and function of the data link layer in preparing communication for transmission on specific media.
	Topologies	Compare the characteristics of media access control methods on WAN and LAN topologies.
	Data Link Frame	Describe the characteristics and functions of the data link frame.

Module	Topic	Objective
Ethernet Switching		Explain how Ethernet operates in a switched network.
	Ethernet Frame	Explain how the Ethernet sublayers are related to the frame fields.
	Ethernet MAC Address	Describe the Ethernet MAC address.

	The MAC Address Table	Explain how a switch builds its MAC address table and forwards frames.
	Switch Speeds and Forwarding Methods	Describe switch forwarding methods and port settings available on Layer 2 switch ports.
Module	**Topic**	**Objective**
Network Layer		Explain how routers use network layer protocols and services to enable end-to-end connectivity.
	Network Layer Characteristics	Explain how the network layer uses IP protocols for reliable communications.
	IPv4 Packet	Explain the role of the major header fields in the IPv4 packet.
	IPv6 Packet	Explain the role of the major header fields in the IPv6 packet.
	How a Host Routes	Explain how network devices use routing tables to direct packets to a destination network.
	Router Routing Tables	Explain the function of fields in the routing table of a router.
Module	**Topic**	**Objective**
Address Resolution		Explain how ARP and ND enable communication on a network.
	MAC and IP	Compare the roles of the MAC address and the IP address.
	ARP	Describe the purpose of ARP.
	Neighbor Discovery	Describe the operation of IPv6 neighbor discovery.
Module	**Topic**	**Objective**
Basic Router Configuration		Implement initial settings on a router and end devices.
	Configure Initial Router Settings	Configure initial settings on a Cisco IOS router.

	Configure Interfaces	Configure two active interfaces on a Cisco IOS router.
	Configure the Default Gateway	Configure devices to use the default gateway.

Module	Topic	Objective
IPv4 Addressing		Calculate an IPv4 subnetting scheme to efficiently segment a network.
	IPv4 Address Structure	Describe the structure of an IPv4 address including the network portion, the host portion, and the subnet mask.
	IPv4 Unicast, Broadcast, and Multicast	Compare the characteristics and uses of the unicast, broadcast and multicast IPv4 addresses.
	Types of IPv4 Addresses	Explain public, private, and reserved IPv4 addresses.
	Network Segmentation	Explain how subnetting segments a network to enable better communication.
	Subnet an IPv4 Network	Calculate IPv4 subnets for a /24 prefix.
	Subnet a /16 and /8 Prefix	Calculate IPv4 subnets for a /16 and /8 prefix.
	Subnet to Meet Requirements	Given a set of requirements for subnetting, implement an IPv4 addressing scheme.
	Variable Length Subnet Masking	Explain how to create a flexible addressing scheme using variable length subnet masking (VLSM).
	Structured Design	Implement a VLSM addressing scheme.

Module	Topic	Objective
IPv6 Addressing		Implement an IPv6 addressing scheme.
	IPv4 Issues	Explain the need for IPv6 addressing.
	IPv6 Addressing	Explain how IPv6 addresses are represented.

	IPv6 Address Types	Compare types of IPv6 network addresses.
	GUA and LLA Static Configuration	Explain how to configure static global unicast and linklocal IPv6 network addresses.
	Dynamic Addressing for IPv6 GUAs	Explain how to configure global unicast addresses dynamically.
	Dynamic Addressing for IPv6 LLAs	Configure link-local addresses dynamically.
	IPv6 Multicast Addresses	Identify IPv6 addresses.
	Subnet an IPv6 Network	Implement a subnetted IPv6 addressing scheme.
Module	**Topic**	**Objective**
ICMP		Use various tools to test network connectivity.
	ICMP Messages	Explain how ICMP is used to test network connectivity.
	Ping and Traceroute Testing	Use ping and traceroute utilities to test network connectivity.
Module	**Topic**	**Objective**
Transport Layer		Compare the operations of transport layer protocols in supporting end-to-end communication.
	Transportation of Data	Explain the purpose of the transport layer in managing the transportation of data in end-to-end communication.
	TCP Overview	Explain characteristics of the TCP.
	UDP Overview	Explain characteristics of the UDP.
	Port Numbers	Explain how TCP and UDP use port numbers.
	TCP Communication Process	Explain how TCP session establishment and termination processes facilitate reliable communication.

	Reliability and Flow Control	Explain how TCP protocol data units are transmitted and acknowledged to guarantee delivery.
	UDP Communication	Describe the UDP client processes to establish communication with a server.
Module	**Topic**	**Objective**
Application Layer		Explain the operation of application layer protocols in providing support to end-user applications.
	Application, Presentation, and Session	Explain how the functions of the application layer, session layer, and presentation layer work together to provide network services to end user applications.
	Peer-to-Peer	Explain how end user applications operate in a peer-topeer network.
	Web and Email Protocols	Explain how web and email protocols operate.
	IP Addressing Services	Explain how DNS and DHCP operate.
	File Sharing Services	Explain how file transfer protocols operate.
Module	**Topic**	**Objective**
Network Security Fundamentals		Configure switches and routers with device hardening features to enhance security.
	Security Threats and Vulnerabilities	Explain why basic security measures are necessary on network devices.
	Network Attacks	Identify security vulnerabilities.
	Network Attack Mitigation	Identify general mitigation techniques.
	Device Security	Configure network devices with device hardening features to mitigate security threats.
Module	**Topic**	**Objective**
Build a Small Network		Implement a network design for a small network to include a router, a switch, and end devices.

	Devices in a Small Network	Identify the devices used in a small network.
	Small Network Applications and Protocols	Identify the protocols and applications used in a small network.
	Scale to Larger Networks	Explain how a small network serves as the basis of larger networks.
	Verify Connectivity	Use the output of the ping and tracert commands to verify connectivity and establish relative network performance.
	Host and IOS Commands	Use host and IOS commands to acquire information about the devices in a network.
	Troubleshooting Methodologies	Describe common network troubleshooting methodologies.
	Troubleshooting Scenarios	Troubleshoot issues with devices in the network.

Notes to Instructors

- All instructors are to use a combination of Packet Tracer and hands on labs (via classroom equipment or the Netlab+ online lab server)
- Assignments consist of labs, quizzes, chapter tests, skills based exam, and a final exam
- This class has an SLO assessment. This assignment must be completed by every student.