Introduction to Network Systems	Scope and Sequence
Unit Lesson	**Objectives**
NETWORKING FUNDAMENTALS	
Networking Concepts	
	Explain what networks are and how they work.
	Explain what network architecture is.
	Identify what every network needs.
	Differentiate between Peer-to-Peer and Client/Server architecture.
	Differentiate between Local Area Networks and Wide Area Networks.
Project: Report: Technology Devices	
Network Devices and Components	
	Explain what a packet is and why it is necessary.
	Explain the uses of and differences between hubs, switches, and routers.
	Describe the parts (connectors, ports, NICs) that link a node to a network.
Network Topologies	
	Describe the importance of balancing reliability, stability, and cost.
	Explain the importance of Ethernet standards.
	Differentiate between bus, ring, star, and mesh topologies.
Project: Hardware Awareness	
The OSI Reference Model	
	List three things that layers accomplish.
	Name all seven layers of the OSI model.
	Identify the tasks of the seven OSI layers.
	List at least two uses for the OSI model.

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	The TCP/IP Networking Model	
		Explain what a protocol is.
		List the layers of the TCP/IP protocol stack and show how they relate to OSI layers.
		Identify and explain the functions of two protocols used at each TCP/IP layer.
		Explain the difference between the OSI and TCP/IP models.
	Project: Slideshow: Networking Layers	
	Data Encapsulation	
		Describe two benefits of data encapsulation.
		Define a data unit and be able to name the data units transmitted at each TCP/IP layer.
		List the information included in headers and footers of each data unit.
		Explain a security risk of encapsulation and discuss a solution.
	Project: Slideshow: Data Encapsulation	
	Test	
NETWORK ACCESS CONCEPTS		
	The Physical Layer	
		Explain the difference between analog and digital signals.
		List the main types of components of the physical layer and give examples of each.
		Identify the main physical differences between LANs and WANs.
	Project: The Physical Layer	
	Fundamentals of Electrical Circuits	
		Define an electric circuit.
		List the components of a circuit.

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		List the forms of the circuit.
		Give three modes of transmitting data.
		List three features of an electromagnetic wave.
		Explain the advantages and disadvantages of wired and wireless networks.
	Network Security at the Physical Layer	
		Describe backup procedures for daily data.
		Explain the role of a DMZ protecting a LAN against Internet intruders.
		Explain the difference between wired and wireless network security measures.
		Describe the importance of monitoring network traffic.
	Project: Under Attack	
	The Data-Link Layer	
		Explain the basics of binary digits.
		Describe the purpose of the data-link layer.
		List and explain three error-checking techniques.
		Explain the difference between a byte and a bit.
	Components of the Data-Link Layer	
		Identify the two sublayers of the data-link layer.
		List five parts of a frame’s header.
		Distinguish between the frame payload and the rest of the frame.
		Explain the difference between a connectionless and a connection-oriented service delivery.
		Explain the difference between polling and token traffic flow techniques.
		Describe the basics of the Aloha protocol, the CSMA/CD protocol, the Slotted Aloha protocol, and the Reservation Aloha protocol.

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Project: FAQ: A Data-Link Sublayer	
Data-Link Layer Devices	
	Describe the basic design, function, and purpose of the NIC.
	Explain the difference between a hub and a switch.
	Define a broadcast storm.
	Explain the use of bridges.
	Understand the general principles for creating a routing table.
Project: Video: Data-Link Hardware	
Test	
LOCAL AREA NETWORKS	
LAN Fundamentals	
	Identify 3 types of network.
	Distinguish between peer-to-peer and server-based networks.
	Specify 4 server functions.
	Compare and contrast token ring networks with an Ethernet network.
	Name two typologies used in Ethernets.
	Explain the problems of spaghetti LANs.
Project: Proposal: Classroom LAN	
Ethernet LANs	
	List three things common to all Ethernet networks.
	Explain what a collision domain is and differentiate it from a broadcast domain.
	Compare the difference between the Ethernet, the Fast Ethernet, and the Gigabit Ethernet.

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		Explain the code letters used at the end of shorthand physical descriptions of the Ethernet.
		Identify the four major formats for Ethernet frames.
	Wireless LANs	
		List the four IEEE standards about WLANs.
		Identify six wireless transmission media.
		Explain the “hidden node” problem and its solution.
		List the four addresses used in a wireless frame.
	Project: Video: Value of Hotspots	
	Network Addressing	
		Explain four concepts that support IP addressing.
		Determine whether an IP address belongs to class A, B, or C.
		Explain a default subnet mask.
		Calculate the value of an 8 bit octet.
		Explain why IPv6 was developed and given its bit size.
	Project: Table: IPV6 Addresses	
	Network Routing and Protocols	
		Explain the difference between a switch and a router.
		Describe the function of a routing table.
		Explain the difference between static and dynamic routing.
		Define an infinite loop.
		Report the function of a routing protocol.
		Explain the difference between an exterior and an interior routing protocol.

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		Explain what distance-vector and link-state means in routing protocols.
	Transport Layer Protocols	
		Explain the role of the transport layer.
		Compare and contrast UDP and TCP protocols.
		List at least 5 application-layer protocols that are part of the TCP/IP stack.
		Explain in detail what the HTTP protocol does.
		Describe the whole process of communication between two computers in terms of all the layers in the TCP/IP model.
	Project: Slideshow: Sending/Receiving a Communication	
	Test	
WIDE AREA NETWORKS AND SECURING THE NETWORK		
	WAN Fundamentals	
		Compare and contrast LANs and WANs.
		Explain the difference between a modem and a CSU/DSU.
		Explain why a WAN connection is often preferable to using the Internet as a connection.
		List three different types of WAN connections and explain how they differ.
	Project: FAQ: WAN Connections	
	WAN Technologies and Protocols	
		List four properties for comparing WAN technologies.
		Compare and contrast POTS v ISDN technologies.
		Explain what the SONET standard does.
		Describe the header and footer of a frame relay encapsulation.

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		Define PPP and list two protocols that are part of its protocol stack.
	WAN Transmission Media	
		List three types of WAN transmission media.
		Compare U.S. and European fiber-optic standards.
		Explain how fiber optics carry a signal.
		Describe fiber optic ring topology.
		Contrast GSM and CDMA wireless technologies.
		List three 4G technologies.
	Project: Slideshow: Fiber Optics	
	Authentication and Access Controls	
		Distinguish between authentication and authorization.
		List five different types of accounts and explain their differences.
		Explain the different functions of server and client in the Kerberos protocol.
		Explain the difference between a public key and a private key.
		Describe the role of a certificate authority.
		List three different types of filtering in access controls.
	Project: FAQ: Public Key Infrastructure (PKI)	
	Network Threats and Mitigation	
		List three types of social threats.
		Explain the difference between four types of malware.
		Define three threats to wireless networks.
		Explain how SSL works.

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		Compare and contrast VPNs with remote access.
		List three ways of raising user security awareness.
	Project: Policy: Password Policy	
	Physical and Hardware Security	
		Define a DMZ.
		List four kinds of servers likely to be found in a DMZ.
		Compare and contrast hardware and software routers.
		Compare and contrast firewalls and bastion hosts.
		Compare and contrast a firewall and an IDS.
		Explain the role of a vulnerability scanner.
	Test	
MANAGING THE NETWORK		
	Managing and Monitoring the Network	
		Identify four administrative functions of concern to a CIO.
		Describe the ticketing process of a client support service.
		Compare and contrast waterfall and agile software development life cycles.
		Describe the reasons for having a change management committee.
		Identify five networking matters that should be documented for an IT department.
	Project: Slideshow: Management	
	Network Troubleshooting	
		Name and explain five network utilities.
		Know how to find the switches associated with a particular utility.

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		Read the results of a ping or tracert command.
		Explain the basic operation of the SNMP protocol.
		Explain the function of a load balancer.
	Project: FAQ: Utilities	
	Software and Hardware Troubleshooting Tools	
		Identify eight tools for testing and repairing a network's physical layer.
		Explain how utilities work together to troubleshoot a network.
		Compare and contrast bandwidth and throughput.
		Identify five event types recorded in a system log.
	The Server in a Network	
		Name two selection considerations when buying a server.
		List two types of modules that permit hot swaps.
		Discuss three installation options.
		Explain the characteristics of nine different application servers.
	Project: Diagram: Web Email Service	
	Networking with Windows	
		Explain what a network operating system is.
		Identify three tools for configuring a Windows server.
		Describe the relationship between a forest and a domain.
		Identify five roles available to an Active Directory server.
		Identify three server applications from Microsoft.
	The Linux Operating System	

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		Describe the basic functions of the Linux kernel.
		Describe the relation between main elements of the Linux kernel.
		List the LAMP applications and explain their use.
		Identify open source products usable on Linux for managing remote access and e-mail servers.
	Project: Report: Network Wish List	
	Test	
COURSE REVIEW AND EXAM		
	Review	
	Exam	