



Scope and Sequence

IT Essentials: PC Hardware and Software v4.0

Target Audience

PC Hardware and Software v4.0 is intended for students in upper secondary schools, technical schools, community colleges, or four-year institutions who want to pursue careers in IT and gain working knowledge of how computers work, how to assemble computers, and how to troubleshoot hardware and software issues.

Prerequisites

There are no prerequisites for this course.

Target Certifications

PC Hardware and Software v4.0 helps to prepare students for the CompTIA A+ certification exams (<http://www.comptia.org>). The fundamentals part of the course, chapters 1–10, prepares students for the required CompTIA A+ Essentials exam. The advanced part of the course, chapters 11–16, prepares students for CompTIA's three job-environment certification exams:

- IT (field) technician (220-602)
- remote support technician (220-603)
- bench technician (220-604)

This course also aligns to the objectives in the first three modules of the EUCIP IT Administrator certification (<http://www.eucip.org>): Module 1 PC Hardware, Module 2 Operating Systems, and Module 3 Local Area Networks and Network Services.

Curriculum Description

This course covers the fundamentals of computer hardware and software as well as advanced concepts. Students who complete this course will be able to describe the internal components of a computer, assemble a computer system, install an operating system, and troubleshoot using system tools and diagnostic software. Students will also be able to connect to the Internet and share resources in a network environment. New topics included in this version include laptops and portable devices, wireless connectivity, security, safety and environmental issues, and communication skills.

Hands-on lab activities will continue to be an essential element of the course. In support of this, virtual learning tools are integrated into this course. The Virtual Laptop and Virtual Desktop are stand-alone tools designed to supplement classroom learning and provide an interactive "hands-on" experience in learning environments with limited physical equipment.

Curriculum Objectives

The primary objective of this course is to prepare students for entry-level positions in the IT field within several different working environments

- A corporate or mobile environment with a high level of face-to-face client interaction. Job titles include enterprise technician, IT administrator, field service technician, or PC technician.
- A remote-based work environment where client interaction, client training, operating systems, and connectivity issues are emphasized. Job titles include remote support technician, help desk technician, call center technician, IT specialist, or IT representative.
- Settings with limited customer interaction where hardware-related activities are emphasized. Job titles include depot technician or bench technician.

In addition, students will gain confidence with the components of desktop and laptop computers by learning the proper procedures for hardware and software installations, upgrades, and troubleshooting.

By the end of the course, students will be able to complete the following objectives:

- Define information technology (IT) and describe the components of a personal computer
- Protect herself or himself against accidents and injury, protect equipment from damage, protect data from loss, and protect the environment from contamination
- Perform a step by step assembly of a desktop computer tower
- Explain the purpose of preventive maintenance and identify the elements of the troubleshooting process
- Explain, install, and navigate an operating system; upgrade components based on customer needs and perform preventive maintenance and troubleshooting
- Describe, remove, and replace select components of a laptop; upgrade components based on customer needs and perform preventive maintenance and troubleshooting
- Describe, remove, and replace select components of a printer/scanner; perform preventive maintenance and troubleshooting
- Describe and install a network; upgrade components based on customer needs and perform preventive maintenance and troubleshooting
- Perform advanced installation of a desktop computer tower; select components based on customer needs and perform preventive maintenance and troubleshooting
- Upgrade security components based on customer needs and perform preventive maintenance and troubleshooting
- Apply good communication skills and professional behavior while working with customers

Minimum System Requirements

The hands-on lab portion of the PC Hardware and Software v4.0 course requires the following computer configurations and peripheral equipment.

Typical Lab Layout

For the best student learning experience, we recommend a typical lab size of 12 to 15 students and a ratio of one Lab PC per student. A ratio of one Lab PC for two students is the minimum acceptable for

the hands-on lab activities. Some of the lab activities require the student Lab PCs to be connected to a local network.

The student Lab PCs will be in various states of assembly and repair and therefore are not suitable for viewing the curriculum.

Lab PC Hardware Requirements

- PC Tower Case with 300W power supply
- PCI, PCIe, or AGP-compatible motherboard
- Intel Pentium/Celeron family, AMD K6/Athlon/Duron family, or compatible processor, 300 MHz or faster recommended
- Cooling fan and heat sink
- Two 128 MB memory modules (minimum) or two 256 MB memory modules (recommended)
 - Some labs will require one module of RAM to be uninstalled or the simulation of a faulty module for troubleshooting purposes.
 - 128 MB is the minimum requirement to run the full functions of Microsoft Windows XP Professional
- Floppy drive
- 15 GB hard drive (minimum); 20 GB or more (recommended)
 - The system must support a full install of Windows XP and two 5 GB partitions.
- CD-ROM (minimum) or 24x CD/DVD-ROM (recommended)
- Ethernet card
- PCI, PCIe (recommended), or AGP video card
- Ribbon cables to connect HDD/CD/Floppy
- Mouse
- Keyboard
- Super VGA (800 x 600) or higher-resolution video monitor

Lab PC Software requirements

PC Hardware and Software v4.0 content focuses on Microsoft Windows XP and Windows 2000 operating systems. Windows Vista is covered since it is not a required subject for either CompTIA A+ or the EUCIP IT Administrator certification. Only the Microsoft Windows XP Professional (Media CD) is needed to complete the curriculum labs

Microsoft offers programs for academic institutions to purchase software at a reduced cost. An example of such a program is the MSDN Academic Alliance, which can be found at <http://msdn.microsoft.com/academic>. Please visit the Microsoft Website for your country or region to learn more.

Lab PC Repair Tools

The computer toolkit should include the following tools:

- Phillips screwdriver
- Flathead screwdriver
- Hex Socket Drivers (various sizes)
- Needle-nose pliers
- Electrostatic discharge (ESD) wrist strap and cord
- Electrostatic discharge (ESD) mat with a ground cord
- Safety glasses
- Lint-free cloth
- Electronics cleaning solution
- Flashlight
- Thermal compound
- Multimeter (optional)
- Compressed air service canister (optional due to globally varying classroom health and safety laws)

Additional Items and Resources

Recommended:

- One Internet connection for each student to conduct Internet searches and download drivers
- One integrated printer/scanner/copier per two Lab PCs
- One Linksys wireless router/switch or equivalent per two Lab PCs, Linksys model WRT 300N preferred
- One Wireless PCI network adapter (compatible with the above wireless router/switch) for each Lab PC

Minimum:

- One Internet connection for Internet searches and driver downloads (this could be the instructor's workstation)
- One integrated printer/scanner/copier for the class to share
- One Linksys wireless router/switch or equivalent for the class to share, Linksys model WRT 300N preferred
- Two Wireless PCI network adapters (compatible with the above wireless router/switch) for the class to share

Minimum Equipment Required to View the Curriculum

The computer-to-student ratio for viewing the curriculum is 1:1. The recommended average class size is between 15 and 20 students. The curriculum computer can be any computer that supports Internet Explorer v6.0 or higher and Flash Player v8.x or higher.

Note: This curriculum also includes optional virtual tools as part of the course content: Virtual Laptop and Virtual Desktop. In order to fully use these optional virtual tools, the curriculum-viewing computers should have a minimum of 512MB RAM and Windows 2000.

Course Outline

PC Hardware and Software Course

This course provides an excellent introduction to the IT industry and in-depth exposure to personal computers, hardware, and operating systems. Students learn the functionality of various hardware and software components and best practices in maintenance and safety issues. Through hands-on lab activities, students learn how to assemble and configure computers, install operating systems and software, and troubleshoot hardware and software problems.

Part 1: Fundamentals

1. Introduction to the Personal Computer

- 1.1 Explain IT industry certifications
 - 1.1.1 Identify education and certifications
 - 1.1.2 Describe the A+ certification
 - 1.1.3 Describe the EUCIP certification
- 1.2 Describe a computer system
- 1.3 Identify the names, purposes, and characteristics of cases and power supplies
 - 1.3.1 Describe cases
 - 1.3.2 Describe power supplies
- 1.4 Identify the names, purposes, and characteristics of internal components
 - 1.4.1 Identify the names, purposes, and characteristics of motherboards
 - 1.4.2 Identify the names, purposes, and characteristics of processor/CPU
 - 1.4.3 Identify the names, purposes, and characteristics of cooling systems
 - 1.4.4 Identify the names, purposes, and characteristics of ROM and RAM
 - 1.4.5 Identify the names, purposes, and characteristics of adapter cards
 - 1.4.6 Identify the names, purposes, and characteristics of storage drives
 - 1.4.7 Identify the names, purposes, and characteristics of internal cables
- 1.5 Identify the names, purposes, and characteristics of ports and cables
- 1.6 Identify the names, purposes, and characteristics of input devices
- 1.7 Identify the names, purposes, and characteristics of output devices
- 1.8 Explain system resources and their purpose, IRQ, I/O Address, and DMA
- 1.9 Chapter summary

2. Safe Lab Procedure and Tool Use

- 2.1 Explain the purpose of safe working conditions and procedures
 - 2.1.1 Identify safety procedures and potential hazards for users and technicians
 - 2.1.2 Identify safety procedures to protect equipment from damage and data from loss
 - 2.1.3 Identify safety procedures to protect the environment from contamination
- 2.2 Identify tools and software used with personal computer components and their purposes
 - 2.2.1 Identify hardware tools and their purpose
 - 2.2.2 Identify software tools and their purpose
 - 2.2.3 Identify organizational tools and their purpose
- 2.3 Implement proper tool use
 - 2.3.1 Demonstrate proper use of an antistatic wrist strap
 - 2.3.2 Demonstrate proper use of antistatic mat
 - 2.3.3 Demonstrate proper use of various hand tools
 - 2.3.4 Demonstrate proper use of cleaning materials
- 2.4 Chapter summary

3. Computer Assembly Step-by-Step

- 3.1 Open the case
- 3.2 Install the power supply
- 3.3 Attach the components to the motherboard and install the motherboard
 - 3.3.1 Install a CPU and a heat sink/fan assembly
 - 3.3.2 Install the RAM
 - 3.3.3 Install the motherboard
- 3.4 Install internal drives
- 3.5 Install drives in external bays
 - 3.5.1 Install the optical drive
 - 3.5.2 Install the floppy drive
- 3.6 Install adapter cards
 - 3.6.1 Install the NIC
 - 3.6.2 Install the wireless NIC
 - 3.6.3 Install the video adapter card
- 3.7 Connect all internal cables
 - 3.7.1 Connect the power cables
 - 3.7.2 Connect the data cables

- 3.8 Re-attach the side panels and connect external cables to the computer
 - 3.8.1 Re-attach the side panels to the case
 - 3.8.2 Connect external cables to the computer
- 3.9 Boot computer for the first time
 - 3.9.1 Identify beep codes
 - 3.9.2 Describe BIOS setup
- 3.10 Chapter summary

4. Basics of Preventive Maintenance and Troubleshooting

- 4.1 Explain the purpose of preventive maintenance
- 4.2 Identify the steps of the troubleshooting process
 - 4.2.1 Explain the purpose of data protection
 - 4.2.2 Gather data from the customer
 - 4.2.3 Verify the obvious issues
 - 4.2.4 Try quick solutions first
 - 4.2.5 Gather data from the computer
 - 4.2.6 Evaluate the problem and implement the solution
 - 4.2.7 Close with the customer
- 4.3 Chapter summary

5. Operating Systems

- 5.1 Explain the purpose of an operating system
 - 5.1.1 Describe the characteristics of modern operating systems
 - 5.1.2 Explain operating system concepts
- 5.2 Describe and compare operating systems to include purpose, limitations, and compatibilities
 - 5.2.1 Describe desktop operating systems
 - 5.2.2 Describe network operating systems
- 5.3 Determine operating system based on customer needs
 - 5.3.1 Identify applications and environments that are compatible with an operating system
 - 5.3.2 Determine minimum hardware requirements and compatibility with the OS platform
- 5.4 Install an operating system
 - 5.4.1 Identify hard drive setup procedures
 - 5.4.2 Prepare hard drive
 - 5.4.3 Install the operating system using default settings

- 5.4.4 Create accounts
- 5.4.5 Complete the installation
- 5.4.6 Describe custom installation option
- 5.4.7 Identify the boot sequence files and Registry files
- 5.4.8 Describe how to manipulate operating system files
- 5.4.9 Describe directory structures
- 5.5 Navigate a GUI (Windows)
 - 5.5.1 Manipulate items on the desktop
 - 5.5.2 Explore control panel applets
 - 5.5.3 Explore administrative tools
 - 5.5.4 Install, navigate, and uninstall an application
 - 5.5.5 Describe upgrading an operating system
- 5.6 Identify and apply common preventive maintenance techniques for operating systems
 - 5.6.1 Create a preventive maintenance plan
 - 5.6.2 Schedule a task
 - 5.6.3 Back up the hard drive
- 5.7 Troubleshoot operating systems
 - 5.7.1 Review the troubleshooting process
 - 5.7.2 Identify common problems and solutions
- 5.8 Chapter summary

6. Laptops and Portable Devices

- 6.1 Describe laptops and other portable devices
 - 6.1.1 Identify some common uses of laptops
 - 6.1.2 Identify some common uses of PDAs and Smartphones
- 6.2 Identify and describe the components of a laptop
 - 6.2.1 Describe the components found on the outside of the laptop
 - 6.2.2 Describe the components found on the inside of the laptop
 - 6.2.3 Describe the components found on the laptop docking station
- 6.3 Compare and contrast desktop and laptop components
 - 6.3.1 Compare and contrast desktop and laptop motherboards
 - 6.3.2 Compare and contrast desktop and laptop processors
 - 6.3.3 Compare and contrast desktop and laptop power management
 - 6.3.4 Compare and contrast desktop and laptop expansion capabilities

- 6.4 Explain how to configure laptops
 - 6.4.1 Describe how to configure power settings
 - 6.4.2 Describe the safe installation and removal of laptop components
- 6.5 Define the different mobile phone standards
- 6.6 Identify common preventive maintenance techniques for laptops and portable devices
 - 6.6.1 Identify appropriate cleaning procedures
 - 6.6.2 Identify optimal operating environments
- 6.7 Describe how to troubleshoot laptops and portable devices
 - 6.7.1 Review the troubleshooting process
 - 6.7.2 Identify common problems and solutions
- 6.8 Chapter summary

7. Printers and Scanners

- 7.1 Describe the types of printers currently available
 - 7.1.1 Describe the characteristics and capabilities of printers
 - 7.1.2 Explain printer-to-computer interfaces
 - 7.1.3 Describe laser printers
 - 7.1.4 Describe impact printers
 - 7.1.5 Describe inkjet printers
 - 7.1.6 Describe solid ink printers
 - 7.1.7 Describe other printer types
- 7.2 Describe the installation and configuration process for printers
 - 7.2.1 Describe how to set up a printer
 - 7.2.2 Explain how to power and connect a device using local or network port
 - 7.2.3 Describe how to install and update a device driver, firmware, and RAM
 - 7.2.4 Identify configuration options and default settings
 - 7.2.5 Explain how to optimize printer performance
 - 7.2.6 Describe how to print a test page
 - 7.2.7 Describe how to share a printer
- 7.3 Describe the types of scanners currently available
 - 7.3.1 Describe scanner types, resolution, and interfaces
 - 7.3.2 Describe all-in-one devices
 - 7.3.3 Describe flatbed scanners
 - 7.3.4 Describe handheld scanners

- 7.3.5 Describe drum scanners
- 7.4 Describe the installation and configuration process for scanners
 - 7.4.1 Explain how to power and connect a scanner
 - 7.4.2 Describe how to install and update the device driver
 - 7.4.3 Identify configuration options and default settings
- 7.5 Identify and apply common preventive maintenance techniques for printers and scanners
 - 7.5.1 Describe printer maintenance
 - 7.5.2 Describe scanner maintenance
- 7.6 Troubleshoot printers and scanners
 - 7.6.1 Review the troubleshooting process
 - 7.6.2 Identify common problems and solutions
- 7.7 Chapter summary

8. Networks

- 8.1 Explain the principles of networking
 - 8.1.1 Define computer networks
 - 8.1.2 Explain the benefits of networks
- 8.2 Describe types of networks
 - 8.2.1 Describe a LAN
 - 8.2.2 Describe a WAN
 - 8.2.3 Describe a WLAN
 - 8.2.4 Explain peer-to-peer networks
 - 8.2.5 Explain client/server networks
- 8.3 Describe basic networking concepts and technologies
 - 8.3.1 Explain bandwidth and data transmission
 - 8.3.2 Describe IP addressing
 - 8.3.3 Define DHCP
 - 8.3.4 Describe Internet protocols and applications
 - 8.3.5 Define ICMP
- 8.4 Describe the physical components of a network
 - 8.4.1 Identify names, purposes, and characteristics of network devices
 - 8.4.2 Identify names, purposes, and characteristics of common network cables
- 8.5 Describe LAN topologies and architectures
 - 8.5.1 Describe topologies

- 8.5.2 Describe LAN architectures
- 8.6 Identify standards organizations
- 8.7 Identify Ethernet standards
 - 8.7.1 Explain cabled Ethernet standards
 - 8.7.2 Explain wireless Ethernet standards
- 8.8 Explain OSI and TCP/IP Data Models
 - 8.8.1 Define the TCP/IP model
 - 8.8.2 Define the OSI model
 - 8.8.3 Compare OSI and TCP/IP
- 8.9 Describe how to configure a NIC and a modem
 - 8.9.1 Install or update a NIC driver
 - 8.9.2 Attach a computer to an existing network
 - 8.9.3 Describe the installation of a modem
- 8.10 Identify names, purposes, and characteristics of other technologies used to establish connectivity
 - 8.10.1 Describe telephone technologies
 - 8.10.2 Define power line communication
 - 8.10.3 Define Broadband
 - 8.10.4 Define VoIP
- 8.11 Identify and apply common preventive maintenance techniques for networks
- 8.12 Troubleshoot a network
 - 8.12.1 Review the troubleshooting process
 - 8.12.2 Identify common network problems and solutions
- 8.13 Chapter summary

9. Security

- 9.1 Explain why security is important
- 9.2 Describe security threats
 - 9.2.1 Define viruses, worms, and Trojans
 - 9.2.2 Explain web security
 - 9.2.3 Define adware, spyware, and grayware
 - 9.2.4 Explain Denial of Service
 - 9.2.5 Describe spam and popup windows
 - 9.2.6 Explain social engineering
 - 9.2.7 Explain TCP/IP attacks

- 9.2.8 Explain hardware deconstruction and recycling
- 9.3 Identify security procedures
 - 9.3.1 Explain what is required in a basic local security policy
 - 9.3.2 Explain the tasks required to protect physical equipment
 - 9.3.3 Describe ways to protect data
 - 9.3.4 Describe wireless security techniques
- 9.4 Identify common preventive maintenance techniques for security
 - 9.4.1 Explain how to update signature files for anti-virus and anti-spyware software
 - 9.4.2 Explain how to install operating systems service packs and security patches
- 9.5 Troubleshoot security
 - 9.5.1 Review the troubleshooting process
 - 9.5.2 Identify common problems and solutions
- 9.6 Chapter summary

10. Communication Skills

- 10.1 Explain the relationship between communication and troubleshooting
- 10.2 Describe good communication skills and professional behavior
 - 10.2.1 Determine the computer problem of the customer
 - 10.2.2 Display professional behavior with the customer
 - 10.2.3 Focus the customer on the problem during the call
 - 10.2.4 Use proper netiquette
 - 10.2.5 Implement time and stress management techniques
 - 10.2.6 Observe Service Level Agreements (SLAs)
 - 10.2.7 Follow business policies
- 10.3 Explain ethics and legal aspects of working with computer technology
- 10.4 Describe call center environment and technician responsibilities
 - 10.4.1 Describe the call center environment
 - 10.4.2 Describe level-one technician responsibilities
 - 10.4.3 Describe level-two technician responsibilities
- 10.5 Chapter summary

Part 2: Advanced

11. Personal Computers

- 11.1 Give an overview of field, remote, and bench technician jobs

- 11.2 Explain safe lab procedure and tool use
 - 11.2.1 Review safe working environment and procedures
 - 11.2.2 Review names, purposes, characteristics, and safe and appropriate use of tools
 - 11.2.3 Identify potential safety hazards and implement proper safety procedures for computer components
 - 11.2.4 Describe environmental issues
- 11.3 Describe situations requiring replacement of computer components
 - 11.3.1 Select a case and power supply
 - 11.3.2 Select a motherboard
 - 11.3.3 Select the CPU and heat sink/fan assembly
 - 11.3.4 Select RAM
 - 11.3.5 Select adapter cards
 - 11.3.6 Select storage devices and hard drives
 - 11.3.7 Select input and output devices
- 11.4 Upgrade and configure personal computer components and peripherals
 - 11.4.1 Upgrade and configure motherboard
 - 11.4.2 Upgrade and configure CPU and a heat sink/fan assembly
 - 11.4.3 Upgrade and configure RAM
 - 11.4.4 Upgrade and configure BIOS
 - 11.4.5 Upgrade and configure storage devices and hard drives
 - 11.4.6 Upgrade and configure input and output devices
- 11.5 Identify and apply common preventive maintenance techniques for personal computer components
 - 11.5.1 Clean internal components
 - 11.5.2 Clean the case
 - 11.5.3 Inspect computer components
- 11.6 Troubleshoot computer components and peripherals
 - 11.6.1 Review the troubleshooting process
 - 11.6.2 Identify common problems and solutions
 - 11.6.3 Apply troubleshooting skills
- 11.7 Chapter Summary

12. Operating Systems

- 12.1 Select the appropriate operating system based on customer needs
 - 12.1.1 Describe operating systems

- 12.1.2 Describe network operating systems
- 12.2 Install, configure, and optimize an operating system
 - 12.2.1 Compare and contrast a default installation and a custom installation
 - 12.2.2 Install Windows XP Professional using a custom installation
 - 12.2.3 Create, view, and manage disks, directories, and files
 - 12.2.4 Identify procedures and utilities used to optimize the performance of operating systems
 - 12.2.5 Identify procedures and utilities used to optimize the performance of browsers
 - 12.2.6 Describe installation, use, and configuration of e-mail software
 - 12.2.7 Set screen resolution and update video driver
 - 12.2.8 Describe installation of a second operating system
- 12.3 Describe how to upgrade operating systems
- 12.4 Describe preventive maintenance procedures for operating systems
 - 12.4.1 Schedule automatic tasks and updates
 - 12.4.2 Set restore points
- 12.5 Troubleshoot operating systems
 - 12.5.1 Review the troubleshooting process
 - 12.5.2 Identify common problems and solutions
 - 12.5.3 Apply troubleshooting skills
- 12.6 Chapter summary

13. Laptops and Portable Devices

- 13.1 Describe wireless communication methods for laptops and portable devices
 - 13.1.1 Describe Bluetooth Technology
 - 13.1.2 Describe Infrared Technology
 - 13.1.3 Describe Cellular WAN Technology
 - 13.1.4 Describe Wi-Fi Technology
 - 13.1.5 Describe Satellite Technology
- 13.2 Describe repairs for laptops and portable devices
- 13.3 Select laptop components
 - 13.3.1 Select batteries
 - 13.3.2 Select a docking station or port replicator
 - 13.3.3 Select storage devices
 - 13.3.4 Select additional RAM

- 13.4 Describe preventive maintenance procedures for laptops
 - 13.4.1 Describe how to schedule and perform maintenance for laptops
 - 13.4.2 Explain how to manage data version control between laptops and desktops
- 13.5 Describe how to troubleshoot a laptop
 - 13.5.1 Review the troubleshooting process
 - 13.5.2 Identify common problems and solutions
 - 13.5.3 Apply troubleshooting skills
- 13.6 Chapter summary

14. Printers and Scanners

- 14.1 Describe potential safety hazards and safety procedures associated with printers and scanners
- 14.2 Install and configure a local printer and scanner
 - 14.2.1 Connect the device to a local port
 - 14.2.2 Install and configure the driver and software
 - 14.2.3 Configure options and default settings
 - 14.2.4 Verify functionality
- 14.3 Describe how to share a printer and a scanner on a network
 - 14.3.1 Describe types of printer servers
 - 14.3.2 Describe how to install network printer software and drivers on a computer
- 14.4 Upgrade and configure printers and scanners
 - 14.4.1 Describe printer upgrades
 - 14.4.2 Describe scanner optimization
- 14.5 Describe printer and scanner preventive maintenance techniques
 - 14.5.1 Determine scheduled maintenance according to vendor guidelines
 - 14.5.2 Describe a suitable environment for printers and scanners
 - 14.5.3 Describe cleaning methods
 - 14.5.4 Describe checking capacity of ink cartridges and toners
- 14.6 Troubleshoot printers and scanners
 - 14.6.1 Review the troubleshooting process
 - 14.6.2 Identify common problems and solutions
 - 14.6.3 Apply troubleshooting skills
- 14.7 Chapter summary

15. Networks

- 15.1 Identify potential safety hazards and implement proper safety procedures related to networks
 - 15.1.1 Explain fiber-optic safety
 - 15.1.2 Explain cable, cable cutters, and cable cutting safety hazards
- 15.2 Design a network based on the customer's needs
 - 15.2.1 Determine a topology
 - 15.2.2 Determine protocols and network applications
- 15.3 Determine the components for your customer's network
 - 15.3.1 Select cable types
 - 15.3.2 Select ISP connection type
 - 15.3.3 Select network cards
 - 15.3.4 Select the network device
- 15.4 Implement the customer's network
 - 15.4.1 Install and test the customer's network
 - 15.4.2 Configure the customer's Internet and network resources
- 15.5 Upgrade the customer's network
 - 15.5.1 Install and configure wireless NIC
 - 15.5.2 Install and configure wireless routers
 - 15.5.3 Test connection
- 15.6 Describe installation, configuration, and management of a simple mail server
- 15.7 Describe preventive maintenance procedures for networks
- 15.8 Troubleshoot the network
 - 15.9.1 Review the troubleshooting process
 - 15.9.2 Identify common problems and solutions
 - 15.9.3 Apply troubleshooting skills
- 15.9 Chapter summary

16. Security

- 16.1 Outline security requirements based on customer needs
 - 16.1.1 Outline a local security policy
 - 16.1.2 Explain when and how to use security hardware
 - 16.1.3 Explain when and how to use security application software
- 16.2 Select security components based on customer needs
 - 16.2.1 Describe and compare security techniques

- 16.2.2 Describe and compare access control devices
- 16.2.3 Describe and compare firewall types
- 16.3 Implement customer's security policy
 - 16.3.1 Configure security settings
 - 16.3.2 Describe configuring firewall types
 - 16.3.4 Describe protection against malicious software
- 16.4 Perform preventive maintenance on security
 - 16.4.1 Describe the configuration of operating system updates
 - 16.4.2 Maintain accounts
 - 16.4.3 Explain data backup procedures, access to backups, and secure physical backup material
- 16.5 Troubleshoot security
 - 16.5.1 Review the troubleshooting process
 - 16.5.2 Identify common problems and solutions
 - 16.5.3 Apply troubleshooting skills
- 16.6 Chapter summary



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