



IT Essentials: PC Hardware and Software v4.1

Scope and Sequence

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Target Audience

The Cisco® IT Essentials: PC Hardware and Software course is designed for Cisco Networking Academy® students seeking career-oriented, entry-level hardware and software skills. Target students include those who want to prepare for careers in information and communication technology (ICT) and students who want to gain skills and working knowledge of how computers work, how to assemble computers, and how to troubleshoot hardware and software issues. IT Essentials: PC Hardware and Software is appropriate for students at many education levels and types of institutions, including high schools, secondary schools, universities, colleges, career and technical schools, community organizations, and other non-traditional learning environments.

Prerequisites

There are no prerequisites for this course.

Target Certifications

The IT Essentials: PC Hardware and Software curriculum helps students prepare for the CompTIA® A+ 2009 certification exams (<http://www.comptia.org>). The fundamentals part of the course, chapters 1–10, helps students prepare for the CompTIA A+ Essentials exam (220-701), which covers the fundamentals of computer technology, networking, and security, and validates the communication skills and professionalism required of all entry-level IT professionals. The advanced part of the course, chapters 11–16, helps students prepare for the CompTIA A+ Practical Application exam (220-702), which builds on the CompTIA A+ Essentials knowledge and skills, with more of a hands-on orientation and scenarios in which troubleshooting and tools must be applied to resolve problems. Students must pass both exams to earn the CompTIA A+ certification.

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. Additional topics covered include laptops and portable devices, wireless connectivity and basic implementation skills, Voice over Internet Protocol (VoIP), security, safety and environmental issues, applied network configuration and troubleshooting skills, and communication skills.

Hands-on lab activities and virtual learning tools are essential elements that are integrated into the curriculum. 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.

Cisco Packet Tracer activities are included to help students learn and practice concepts introduced in the fundamental and advanced chapters. The Packet Tracer activities will be designed for use with Packet Tracer 5.2. The inclusion of Packet Tracer activities provides learning experiences that align with the new CompTIA A+ certification objectives without requiring academies to purchase extra networking equipment.

Curriculum Objectives

The primary objective of this course is to help students prepare for entry-level positions in the ICT field. Job titles include enterprise technician, IT administrator, field service technician, call center technician, help desk technician, and PC or support technician.

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

After completing the IT Essentials: PC Hardware and Software course, students will be able to complete the following tasks:

- Define information technology (IT) and describe the components of a personal computer
- Describe how to protect self, equipment, and the environment from accidents, damage, and contamination
- Perform a step-by-step assembly of a desktop computer and install and navigate an operating system
- Explain and perform preventive maintenance
- Explain the steps of the troubleshooting process and perform basic troubleshooting
- Upgrade or replace components of a laptop, printer, or scanner based on customer needs
- Configure computers to attach to an existing network
- Implement basic physical and software security principles
- Apply good communications skills and professional behavior while working with customers
- Assess customer needs, analyze possible configurations, and provide solutions or recommendations for hardware, operating systems, networking, and security

Minimum System Requirements

For the optimal 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 during the course and therefore are not suitable for viewing the curriculum content.

Lab PC Hardware Requirements

Description	Qty
PC Tower Case with 300W power supply	1
PCI, PCIe, or AGP-compatible motherboard	1
Intel Pentium/Celeron family, AMD K6/Athlon/Duron family, or compatible processor, 300 MHz or faster recommended	1
Cooling fan and heat sink	1
128 MB memory modules (minimum) or 256 MB memory modules (recommended) <ul style="list-style-type: none"> • 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 Windows XP Pro 	2
Floppy drive	1
15 GB hard drive (minimum); 20 GB or more (recommended) <ul style="list-style-type: none"> • The system must support a full install of Windows XP and two 5 GB partitions. 	1

CD-ROM (minimum) or 24x CD/DVD-ROM (recommended)	1
Ethernet card	1
PCI, PCIe (recommended), or AGP video card	1
Ribbon cables to connect HDD/CD/Floppy	Varies
Mouse	1
Keyboard	1
Super VGA (800 x 600) or higher-resolution video monitor	1

Note: The equipment listed above is the minimum set and can be substituted with equal or higher specifications.

Lab PC Software Requirements

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
- Compressed air service canister (optional due to globally varying classroom health and safety laws)
- Power supply tester (optional)
- Cable testers (optional)
- Network Loop back plugs (optional)

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

IT Essentials: PC Hardware and Software Outline

This course provides an introduction to the ICT 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 Chapter Outline
Chapter 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 EU CIP 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 CPUs
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
1.9 Chapter summary
Chapter 2. Safe Lab Procedures 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 an 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
Chapter 3. Computer Assembly - StepbyStep
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
Chapter 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 Identify the problem
4.2.3 Establish a theory of probable causes
4.2.4 Determine an exact cause
4.2.5 Implement the solution
4.2.6 Verify solution and full system functionality
4.2.7 Document findings
4.3 Chapter summary
Chapter 5. Fundamental 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
Chapter 6. Fundamental 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
6.4.3 Laptop communication hardware installation and configuration
6.5 Compare 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
Chapter 7. Fundamental Printers and Scanners
7.1 Describe the types of printers currently available
7.1.1 Describe characteristics and capabilities of printers
7.1.2 Describe printer to computer interfaces

7.1.3 Describe laser printers
7.1.4 Describe impact printers
7.1.5 Describe ink jet 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

Chapter 8. Fundamental 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 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
8.10.5 Define VPN
8.11 Identify and apply common preventive maintenance techniques used 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
Chapter 9. Fundamental 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 data wiping, hard drive destruction 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
Chapter 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
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 Chapter Outline

Chapter 11. Advanced 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 a motherboard
11.4.2 Upgrade and configure a 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
Chapter 12. Advanced 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

12.1.3 Windows OS directory structures
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 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
12.2.9 Windows CLI commands
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. Advanced 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
Chapter 14. Advanced 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
Chapter 15. Advanced 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 an 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 a wireless NIC
15.5.2 Install and configure a wireless routers
15.5.3 Test a 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
15.8.1 Review the troubleshooting process
15.8.2 Identify common problems and solutions
15.8.3 Apply troubleshooting skills
15.9 Chapter summary

Chapter 16. Advanced 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
16.3.3 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