



Lesson Plans

CompTIA's A+ Essentials

(Exam 220-601)

Version 7.1

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Course Overview

This course prepares students for the A+ Essentials certification exam (220-601) by CompTIA. The A+ Essentials exam covers basic operating system and hardware concepts.

To obtain the certification you must pass two exams. In addition to the Essentials exam, one specialization exam is required. Specialization exams include:

- A+ IT Technician (exam 220-602)
- A+ Remote Support Technician (exam 220-603)
- A+ Depot Technician (exam 220-604)

This course covers content for the A+ Essentials exam. TestOut training is also available for the IT Technician exam. You should study the material in the Essentials course before studying for the IT Technician exam.

The A+ certification is an entry-level certification. You should have a basic understanding of computers before beginning your studies.

Module 1 – Computing Overview

This module teaches the students to use the hardware simulator, and provides an overview of basic hardware components and essential information about operating systems.

Module 2 – PC Technician

This module teaches the fundamentals of performing as a PC Technician, this includes protecting computer equipment, personnel and the environment. Communication skills and attitudes associated with professionalism of a PC Technician are stressed. Also discussed are preventative maintenance concerns, diagnostic procedures and troubleshooting techniques.

Module 3 – System Components

In Module 3 students will learn to identify and assemble PC system components. These include system cases, power supply, motherboards, buses, memory, and BIOS.

Module 4 – File System

Module 4 provides a basic overview of the file system. Students will learn the basic components of a file system, how to navigate a file system, and how to select a file system for a hard drive, file extensions, and NTFS file attributes.

Module 5 – Peripheral Devices

Module 5 starts with the procedures used to physically install peripheral devices. It then covers input interfaces used for connection devices: serial, parallel, PS/2, USB, and IEEE 1394 (Firewire). Students will learn how to visually recognize and select the correct port to use when installing input devices, display devices, and sound devices. Techniques for troubleshooting devices are presented.

Module 6 – Storage Devices

Module 6 provides a basic overview of long-term storage devices. These devices include floppy disks, hard disks, optical discs, flash devices, and tape drives.

Module 7 – Networking

In Module 7 students will learn the basics of networking. This includes connection hardware (coaxial, twisted pair, fiber optic, and wireless), network addressing, and protecting the network using firewalls. Also presented are the techniques used to troubleshoot network problems.

Module 8 – Printing

Module 8 provides an overview of printing. This includes the basics of six types of printers: dot matrix, ink jet, laser, dye sublimation, solid ink, and thermal. Students will become familiar with the factors to consider when selecting and installing a printer. The Windows 2000 and Windows XP concept of a logical printer is taught in this module. They will also learn how to share a local printer as a network printer and how to troubleshoot common printing problems.

Module 9 – Portable Devices

In Module 9 students will become familiar with portable devices that are currently available. This includes laptops, Personal Digital Assistants (PDAs), and Tablet PCs. They will learn power management strategies to reduce the amount of power consumed by portable devices and guidelines for troubleshooting laptop computers.

Module 10 – System Management

Module 10 discusses system management. This includes gaining an understanding of system files used to boot the system and compose the Windows registry, disaster recovery tools used to restore operating system files in case of a disaster, backup and restore strategies, and updating the operating system using hotfixes and service packs.

Module 11 – Security

In Module 11 students will learn current threats to the security of data, including malware issues and social engineering attacks. Students will learn strategies to physically secure the network and how to use the Windows Local Security Policy to manage the system and users.

Module 12 – Windows Installation

In Module 12 students will learn how to install Windows XP. Compatibility issues, hardware requirements, and available installation methods are presented. Important steps to take after installing Windows are also presented.

Module 13 – Optimization

Module 13 covers performance optimization of PC systems. This module discusses the optimizing of video subsystems and hard disks by upgrading hardware and utilizing

software. It also includes information on configuring virtual memory to optimize memory. Students will learn methods to prevent the overheating of systems.

Module 14 – System Recovery

In Module 14 students will learn the methods to recover from a system failure. To do this they need to become familiar with common system errors, lockups, and startup error messages and error codes. Students will learn methods to recover from a system failure.

Section 1.1: Course Introduction

Preparation

The video introduces the student to the A+ certification program, the two exams required to be A+ certified and the course content that a student will be tested on for the A+ Essentials Exam.

Lecture Focus Questions:

- Why would a student select one elective exam over another?
- What is the exam number for the A+ Essentials exam?
- What part of the A+ Essentials content is *not* vendor-neutral?

Time

About 10 minutes

Section 1.2: Using the Simulator

Preparation

This section is an overview of how to use the hardware simulator included in this course. Experiment with the simulations until you are familiar with how the hardware simulator works. You will recognize the simulations in this course by the mouse icon to the left of the entry.

Time

About 30 minutes

Lab/Activity

- Put an Item on the Workbench
- Select an Item Based on Its Documentation
- Select Item Categories
- Install and Uninstall Components
- Set Dials and Switches
- Add Cabled Components
- Using the XP Simulator

Section 1.3: Hardware Basics

Preparation

This section provides a basic overview of computer hardware. It discusses the components that perform the basic functions of a computer. These functions include inputting information into the PC, processing the information, storing the information, outputting the information, and sharing the information through networking and communications.

Students will need to become very familiar with a variety of external connectors that are used on PCs to connect common peripherals to standard ports. They should also be able to recognize by sight the internal components of a PC such as the power supply, motherboard, CPU, expansion slots, and storage devices.

A+ Essentials Objectives

- 1.1 Identify the fundamental principles of using personal computers
 - Identify the names, purposes and characteristics of storage devices
 - Identify the names, purposes and characteristics of input devices for example: mouse, keyboard, bar code reader, multimedia (e.g. web and digital cameras, MIDI, microphones), biometric devices, touch screen.
 - Identify the names, purposes and characteristics of ports and cables for example: USB 1.1 and 2.0, parallel, serial, IEEE 1394/firewire, RJ45 and RJ11, PS2/Mini-DIN, centronics (e.g. mini, 36) multimedia (e.g. 1/8 connector, MIDI Coaxial, SPDIF)

Lecture Focus Questions:

- What is the difference between hardware, software, and firmware?
- What types of devices use USB ports?
- What are common input and output devices?
- What is the definition of processing?
- What are the most common types of storage devices?
- Why is it important to increase componentization and standardization?

Time

About 20 minutes

Lab/Activity

- Set Up a Computer

Section 1.4: Operating System Basics

Preparation

This section presents fundamental information about an operating system. It discusses, the actions that can be performed by an operating system, possible operating system attributes, parts of an operating system, and commonly used operating systems. Students will learn how to use Windows utilities to find files and programs and how to configure the Windows Start Menu and System Tray.

A+ Essentials Objectives

- 3.1 Identify the fundamentals of using operating systems
 - Identify differences between operating systems (e.g. Mac, Windows, Linux) and describe operating system revision levels including GUI, system requirements, application and hardware compatibility
 - Describe features of operating system interfaces, for example:
 - Windows Explorer
 - My Computer
 - Control Panel
 - Command Prompt
 - My Network Places

Lecture Focus Questions:

- What are the functions of the *kernel*?
- What is the difference between a GUI and a CLI?
- Which type of user would the Macintosh operating system be best suited for?
- How does the development of Linux differ from the development of Windows?

Time

About 60 minutes

Section 2.1: Protection and Safety

Preparation

This section discusses how to protect computer equipment, personnel and the environment. It covers the measures to take to protect computer equipment from damage from Electrostatic Discharge (ESD). It also discusses the actions that will ensure personal safety when working with computer components and how to dispose properly of computer equipment and hazardous chemicals. Students will learn how to implement appropriate grounding procedures to protect against ESD.

A+ Essentials Objectives

- 7.1 Describe the aspects and importance of safety and environmental issues
 - Identify potential safety hazards and take preventive action
 - Use Material Safety Data Sheets (MSDS) or equivalent documentation and appropriate equipment documentation
 - Use appropriate repair tools
 - Describe methods to handle environmental and human (e.g. electrical, chemical, physical) accidents including incident reporting
- 7.2 Identify potential hazards and implement proper safety procedures including ESD precautions and procedures, safe work environment and equipment handling
- 7.3 Identify proper disposal procedures for batteries, display devices and chemical solvents and cans

Lecture Focus Questions:

- How can ESD be a hazard to electronic computer components?
- What is the difference between a static-shielding bag and a static-resistant bag?
- What steps can you take to reduce ESD if you do not have the proper equipment handy?
- What is the MSDS? When would the information it provides be important?
- Which PC components require extra care to protect your personal safety?

Time

About 60 minutes

Section 2.2: Professionalism

Preparation

This section presents the elements associated with professionalism of a PC Technician. These include good communication skills, dealing with customers in a respectful manner, and acting with integrity.

A+ Essentials Objectives

- 8.1 Use good communication skills including listening and tact/discretion, when communicating with customers and colleagues
 - Use clear, concise and direct statements
 - Allow the customer to complete statements—avoid interrupting
 - Clarify customer statements—ask pertinent questions
 - Avoid using jargon, abbreviations and acronyms
 - Listen to customers
- 8.2 Use job-related professional behavior including notation of privacy, confidentiality and respect for the customer and customers' property
 - Behavior
 - Maintain a positive attitude and tone of voice
 - Avoid arguing with customers and/or becoming defensive
 - Do not minimize customers' problems
 - Avoid being judgmental and/or insulting or calling the customer names
 - Avoid distractions and/or interruptions when talking with customers
 - Property
 - Telephone, laptop, desktop computer, printer, monitor, etc.

Lecture Focus Questions:

- What specific things can you do to improve your people skills?
- What actions and comments contribute to common stereotypes about PC technicians?
- How does professionalism affect customer satisfaction?
- How does respect affect your actions towards customers?

Time

About 30 minutes

Section 2.3: PC Maintenance

Preparation

In this section students will learn how to protect PCs through preventative maintenance including ventilation, backups, and the environment where the PC is deployed. Students will also learn how to safely clean computer components and the tools used to repair and maintain a computer.

A+ Essentials Objectives

- 1.4 Perform preventive maintenance on personal computer components
 - Identify and apply basic aspects of preventive maintenance theory
 - Visual/audio inspection
 - Scheduling preventive maintenance
 - Use of appropriate repair tools and cleaning materials
 - Ensuring proper environment

Lecture Focus Questions:

- Why is dust an enemy to a computer?
- What will too much, or too little, humidity do to a computer?
- What types of materials can you use to clean internal PC components?
- How are backups related to preventive maintenance?

Time

About 45 minutes

Section 2.4: Software Tools

Preparation

Students will become familiar with the Windows utilities used to configure a computer, locate settings, and accomplish given tasks. They will also learn how to analyze PC hardware using the SiSoftware Sandra software package.

A+ Essentials Objectives

- 3.1 Identify the fundamentals of using operating systems
 - Describe features of operating system interfaces
 - Control Panel
 - Command Prompt
 - My Network Places
- 3.3 Identify tools, diagnostic procedures and troubleshooting techniques for operating systems
 - Identify the names, locations, purposes, and characteristics of operating system utilities
 - Disk management tools (e.g. DEFRAG, NTBACKUP, CHKDSK, Format)
 - System management tools (e.g. device and task manager, MSCONFIG.EXE)

Lecture Focus Questions:

- How can the System Configuration Utility help in troubleshooting?
- What is the difference between the Control Panel and Device Manager?
- How are devices organized in Device Manager?
- What are the three types of events you might see in Event Viewer?
- Which tool lets you view running processes and current memory use?

Time

About 45 minutes

Lab/Activity

- View Control Panel Utilities
- Locate Control Panel Settings

Section 2.5: Troubleshooting Overview

Preparation

In this section students will learn basic diagnostic procedures and troubleshooting techniques. They will learn that following a systematic approach to problem solving is usually the most efficient method of troubleshooting.

A+ Essentials Objectives

- 1.3 Identify tools, diagnostic procedures and troubleshooting techniques for personal computer components
 - Recognize the basic aspects of troubleshooting theory
 - Perform backups before making changes
 - Assess a problem systematically and divide large problems into smaller components to be analyzed individually
 - Verify even the obvious, determine whether the problem is something simple and make no assumptions
 - Research ideas and establish priorities
 - Document findings, actions and outcomes
 - Identify and apply basic diagnostic procedures and troubleshooting techniques
 - Identify the problem including questioning user and identifying user changes to computer
 - Analyze the problem including potential causes and make an initial determination of software and/or hardware problems
 - Test related components including inspection, connections, hardware/software configurations, device manager and consult vendor documentation
 - Evaluate results and take additional steps if needed such as consultation, use of alternate resources, manuals
 - Document activities and outcomes

Lecture Focus Questions:

- Why is checking the obvious first so important?
- Why are driver and operating system updates so important?
- What is the last step of troubleshooting that is commonly overlooked by PC technicians?
- What place does intuition have in the troubleshooting process?
- How could user education be a beneficial step in the troubleshooting process?

Time

About 30 minutes

Section 3.1: System Cases and Power

Preparation

In this section the students should become familiar with the role and functions of the PC system case, the different sizes of system cases (tower, mini-tower, mid-tower, desktop, and slimline), and the three different form factors (AT, ATX, and BTX) that must be considered when purchasing system components. In a given PC the power supply, system case, and motherboard must all match the same form factor.

A+ Essentials Objectives

- 1.1 Identify the fundamental principles of using personal computers
 - Identify the names, purposes and characteristics of motherboards
 - Form Factor (e.g. ATX/BTX, micro ATX/NLX)
 - Identify the names, purposes and characteristics of power supplies, for example: AC adapter, ATX, proprietary, voltage
 - Identify the names, purposes and characteristics of cooling systems, for example: case fans

Lecture Focus Questions:

- What improvements have been made to the ATX over the original AT?
Why were these changes necessary?
- Why must the case and the power supply be matched to the motherboard?
- How does the BTX form differ from the ATX form?
- What are the standard components typically included with a system case?
- How does the case form affect the type of power supply you purchase?
- What is a soft power supply?

Time

About 30 minutes

Section 3.2: Motherboards and Buses

Preparation

In this section students will learn how to recognize by sight typical motherboard components and common expansion bus types.

A+ Essentials Objectives

- 1.1 Identify the fundamental principles of using personal computers
 - Identify the names, purposes and characteristics of motherboards
 - Components
 - Integrated I/Os (e.g. sound, video, USB, serial, IEEE 1394/firewire, parallel, NIC, modem)
 - Memory slots (e.g. RIMM, DIMM)
 - Processor sockets
 - Bus architecture
 - Bus slots (e.g. PCI, AGP, PCIe, AMR, CNR)
 - Chipsets
 - BIOS/CMOS/Firmware
 - Riser card/daughter board
 - Identify the names, purposes and characteristics of adapter cards
 - Video including PCI/PCIe and AGP Multimedia

Lecture Focus Questions:

- What factors will you consider when selecting a motherboard?
- What is the difference between the northbridge and southbridge chips on a motherboard?
- How can you add peripheral devices to a system?
- How are PCI and PCI Express different?

Time

About 30 minutes

Section 3.3: Processors

Preparation

This section covers the factors to consider when selecting a CPU. These include selecting the right kind of socket, CPU speed, cache, and transistors. Students need to be aware that the motherboard and CPU must match. Either the CPU must be supported by the motherboard, or the motherboard must support the processor.

A+ Essentials Objectives

- 1.1 Identify the fundamental principles of using personal computers
 - Identify the names purposes and characteristics of processor/CPUs
 - CPU chips (e.g. AMD, Intel)
 - CPU technologies
 - Hyperthreading
 - Dual core
 - Throttling
 - Micro code (MMX)
 - Overclocking
 - Cache
 - VRM
 - Speed (real vs. actual)
 - 32 vs. 64 bit
- 2.1 Identify the fundamental principles of using laptops and portable devices
 - Identify and distinguish between mobile and desktop motherboards and processors including throttling, power management and WiFi

Lecture Focus Questions:

- What is the difference between the three levels of cache memory?
- How does the CPU socket style determine which CPU could be installed in a specified computer?
- What factors should be considered when comparing the speed of computers?
- Which CPU feature(s) might be required by a computer used for multimedia development?
- Why is input/output throttling important?
- How does overclocking work? What are its drawbacks?

Time

About 45 minutes

Section 3.4: Memory

Preparation

In this section students will learn about the different types of Read-only Memory (ROM) and Random Access Memory (RAM) used in computers. They will learn the function of the address bus and how to recognize common RAM packaging by sight. Students will also learn the factors to consider when selecting a RAM module for a given PC system.

A+ Essentials Objectives

- 1.1 Identify the fundamental principles of using personal computers
 - Identify the names, purposes and characteristics of memory
 - Types of memory (e.g. DRAM, SRAM, SDRAM, DDR/DDR2, RAMBUS)
 - Operational characteristics
 - Memory chips (8, 16, 32)
 - Parity versus non-parity
 - ECC vs. non-ECC
 - Single-sided vs. double-sided

Lecture Focus Questions:

- How does RAM differ from ROM?
- What is the difference between SRAM and DRAM?
- What are the most common types of RAM packaging?
- Why is consulting the motherboard documentation so important when purchasing memory?
- Besides counting the number of pins, how can you tell the difference between 168-pin DIMMs and DDR modules? How can you tell the difference between DDR and DDR-2 modules?
- What is the difference between ECC and registered memory?

Time

About 75 minutes

Section 3.5: System Resources

Preparation

This section covers the processor and memory resources that are allocated using the IRQ, I/O Address, and DMA channels. Students will learn how to view system resources using Windows Device Manager.

A+ Essentials Objectives

- 1.2 Install, configure, optimize and upgrade personal computer components
 - Add, remove and configure basic input and multimedia dev

Lecture Focus Questions:

- What are IRQ interrupts and how do they function?
- How do PCI buses address the problem of limited interrupts?
- What types of devices use DMA channels?
- What is Ultra DMA and how does it affect traditional DMA channel functions?
- Why must I/O addresses be unique?
- Why do you typically not need to memorize common resource assignments?
- What is required to support Plug-and-Play in a system?

Time

About 25 minutes

Section 3.6: BIOS

Preparation

This section discusses the Basic Input Output System (BIOS), which is a collection of programs that allow the CPU to communicate with other devices. The BIOS cannot be rewritten. Also discussed is the Complementary Metal-Oxide Semiconductor (CMOS) that contains basic configuration data the computer uses to start up. The CMOS can be written to and the parameters can be changed as necessary, using the CMOS editor.

A+ Essentials Objectives

- 1.1 Identify the fundamental principles of using personal computers
 - Identify the names, purposes and characteristics of motherboards
 - BIOS/CMOS/Firmware
- 1.3 Identify tools, diagnostic procedures and troubleshooting techniques for personal computer components
 - Recognize the names, purposes, characteristics and appropriate application of tools for example: BIOS, self-test, hard drive self-test and software diagnostics test
- 1.4 Perform preventive maintenance on personal computer components
 - Identify and apply basic aspects of preventive maintenance theory for example:
 - Driver/firmware updates

Lecture Focus Questions:

- What are the functions of the BIOS?
- What is the role of CMOS? How does it differ from the BIOS?
- Why does the CMOS require a battery?
- What determines the keystroke to open a CMOS editor? How can you find this information?

Time

About 25 minutes

Lab/Activity

- Find BIOS Settings
- Turn on Num Lock

Section 4.1: File System Overview

Preparation

This section provides a basic overview of the file system. Students will learn the four main components of a file system and how to navigate a file system. They will also learn different types of storage devices that contain file systems.

A+ Essentials Objectives

- 3.1 Identify the fundamentals of using operating systems
 - Identify concepts and procedures for creating, viewing, managing disks, directories and files in operating systems
 - Disks (e.g. active, primary, extended and logical partitions)
 - File systems (e.g. FAT 32, NTFS)
 - Directory structures (e.g. create folders, navigate directory structures)
 - Files (e.g. creation, extensions, attributes, permissions)

Lecture Focus Questions:

- What is the difference between a *partition* and a *volume*?
- How can a single physical disk be divided into multiple logical storage units?
- How can a single volume span multiple disks?
- How many partitions can a single device have? What is the minimum amount of partitions?
- How would partitioning a hard drive benefit a computer?
- What is the relationship between a file and a directory?

Time

About 25 minutes

Section 4.2: File Systems

Preparation

This section teaches a student how to select a file system for a hard drive. Three file systems are discussed, with a comparison of the properties of each file system. Students will learn how to format an existing drive and convert a hard drive from a FAT32 to a NTFS file system.

A+ Essentials Objectives

- 3.1 Identify the fundamentals of using operating systems
 - Identify concepts and procedures for creating, viewing, managing disks, directories and files in operating systems for example:
 - File systems (e.g. FAT 32, NTFS)
- 3.2 Install, configure, optimize and upgrade operating systems—references to upgrading from Windows 95 and NT may be made
 - Identify procedures for installing operating systems including:
 - Operating system installation options (e.g. file system type)
- 3.3 Identify tools, diagnostic procedures and troubleshooting techniques for operating systems
 - Identify the names, locations, purposes and characteristics of operating system utilities for example:
 - Disk management tools (e.g. Format)

Lecture Focus Questions:

- How is NTFS different than FAT16 and FAT32?
- Why should you back up all data before formatting a drive?
- How can you reformat a drive from FAT to NTFS without losing all of the data?
- Which operating systems can use NTFS?

Time

About 40 minutes

Lab/Activity

- Format Drives

Section 4.3: Managing Files

Preparation

In this section students will learn how to manage files. To do this, it is important that students are familiar with common file extensions and NTFS file attributes. Students will learn how to assign attributes to folders and files, compress a drive, folder, or file, and encrypt a folder, or file.

A+ Essentials Objectives

- 3.1 Identify the fundamentals of using operating systems
 - Identify concepts and procedures for creating, viewing, managing disks, directories and files in operating systems
 - Directory structures (e.g. create folders, navigate directory structures)
 - Files (e.g. creation, extensions, attributes, permissions)
- 3.3 Identify tools, diagnostic procedures and troubleshooting techniques for operating systems
 - Identify the names, locations, purposes and characteristics of operating system utilities
 - File management tools (e.g. Windows Explorer, ATTRIB.EXE)

Lecture Focus Questions:

- What is the difference between 8.3, long file names, and Unicode?
- What do file extensions indicate?
- What are common extensions for text documents?
- How can attributes add a level of security to files and folders?
- What attributes are supported by NTFS that are not supported by FAT or FAT32?

Time

About 60 minutes

Lab/Activity

- Set Attributes
- Compress a Drive
- Encrypt a Folder and Its Contents

Section 4.4: NTFS Permissions

Preparation

This section discusses the NTFS permissions used to control access to resources. With NTFS permissions, each file and folder has an access control list (ACL). The ACL identifies the users or groups and their level of access to the folder or file. Students will learn how to assign permissions to a user, group, file, or directory.

A+ Essentials Objectives

- 6.1 Identify the fundamental principles of security
 - Identify names, purposes and characteristics of hardware and software security for example:
 - File system security (e.g. FAT32 and NTFS)
- 6.3 Identify tool, diagnostic procedures and troubleshooting techniques for security
 - Diagnose and troubleshoot hardware, software and data security issues for example:
 - File system (e.g. FAT32, NTFS)

Lecture Focus Questions:

- How are the rights assigned to the Power User group different than the rights assigned to the Administrator group?
- What is the purpose of the Backup group?
- Which NTFS permissions are required to allow a user to open, edit, and save changes to a document?
- How does file ownership affect access and permissions?

Time

About 50 minutes

Lab/Activity

- Configure NTFS Permissions 1
- Configure NTFS Permissions 2

Section 5.1: Installing Devices

Preparation

This section discusses installing new hardware in a Windows XP system. The procedures to physically install a hardware device are discussed, but the actual installation of hardware devices is discussed in a later lesson. Students will learn how to use Device Manager to install, disable, enable, and remove hardware components. They will also learn how to manually install and configure a device.

A+ Essentials Objectives

- 1.2 Install, configure, optimize and upgrade personal computer components
 - Add, remove and configure basic input and multimedia devices
- 1.4 Perform preventive maintenance on personal computer components
 - Identify and apply basic aspects of preventive maintenance theory
 - Driver/firmware updates
- 3.2 Install, configure, optimize and upgrade operating systems—references to upgrading from Windows 95 and NT may be made
 - Install/add a device including loading, adding device drivers and required software including:
 - Determine whether permissions are adequate for performing the task
 - Device driver installation (e.g. automated and/or manual search and installation of device drivers)
 - Using unsigned drivers (e.g. driver signing)
 - Verify installation of the driver (e.g. device manager and functionality)

Lecture Focus Questions:

- How can a device's compatibility with an operating system be verified?
- When is manual configuration of a device necessary?
- What types of users can install devices?
- What is a driver? How are they updated?
- What is the importance of driver signing? What should you be aware of when using a driver that is not signed?

Time

About 60 minutes

Lab/Activity

- Install a Plug and Play Device
- Use the Add Hardware Wizard

- Disable and Enable Devices
- Remove a Device

Section 5.2: Serial, Parallel, and PS/2

Preparation

This section discusses three different input interfaces for connecting devices: serial, parallel and PS/2. These are older interfaces which are rapidly being replaced by Universal Serial Bus (USB). Students will learn how to visually recognize and select the correct port to use when installing different peripheral devices.

A+ Essentials Objectives

- 1.1 Identify the fundamental principles of using personal computers
 - Identify the names, purposes and characteristics of adapter cards
 - I/O (serial, parallel)
 - Identify the names, purposes and characteristics of ports and cables for example: parallel, serial, PS2/Mini-DIN, centronics (e.g. mini, 36)
- 1.2 Install, configure, optimize and upgrade personal computer components
 - Add, remove and configure basic input and multimedia devices

Lecture Focus Questions:

- What is the difference between serial and parallel communications?
- Theoretically, which form of communication (serial or parallel) provides faster communication?
- Generally speaking, which form of communication (serial or parallel) will provide communication over longer distances without amplification?
- What is the relationship between the serial port and the COM ports?
Between the parallel port and LPT ports?
- What is the difference between SPP and EPP standards?
- What are three ways you can tell the difference between a keyboard and mouse PS/2 port?
- How do you configure a computer to use EPP?

Time

About 45 minutes

Lab/Activity

- Install PS/2 Devices
- Install a Serial Device
- Install a Parallel Device
- Change the Parallel Port Mode

Section 5.3: USB

Preparation

This section discusses the newer serial interface, Universal Serial Bus (USB), which supports almost any kind of peripheral device. Students will learn how to identify typical USB connectors and ports, install USB devices, and enable a USB port.

A+ Essentials Objectives

- 1.1 Identify the fundamental principles of using personal computers
 - Identify the names, purposes and characteristics of adapter cards
 - I/O (USB)
 - Identify the names, purposes and characteristics of ports and cables for example: USB 1.1 and 2.0
- 1.2 Install, configure, optimize and upgrade personal computer components
 - Add, remove and configure basic input and multimedia devices

Lecture Focus Questions:

- What are the differences between USB 1.1 and 2.0?
- What types of devices are typically self-powered? Bus-powered?
- What are the power requirements for a low-powered and high-powered bus powered-device?
- Which computer operating systems support USB?

Time

About 45 minutes

Lab/Activity

- Install a USB Keyboard and Mouse
- Connect a USB Printer
- Connect a Digital Camera
- Install USB Devices
- Enable USB Support

Section 5.4: IEEE 1394 (Firewire)

Preparation

In this section students will learn about Firewire, which is trademarked by Apple Computers, Inc. and is the basis of the IEEE 1394 standard. Firewire is a high-speed capacity connectivity option. Students will learn how to visually recognize IEEE cables and connectors and to connect peripheral devices to a Firewire port.

A+ Essentials Objectives

- 1.1 Identify the fundamental principles of using personal computers
 - Identify the names, purposes and characteristics of ports and cables, for example: IEEE 1394/firewire
- 1.2 Install, configure, optimize and upgrade personal computer components
 - Add, remove and configure basic input and multimedia devices

Lecture Focus Questions:

- Which operating systems support IEEE 1394?
- What are the additional functions of a six-wire IEEE 1394 over a four-wire IEEE 1394 cable?
- What is the maximum cable length of an IEEE 1394 cable?
- What are common devices that use IEEE 1394?

Time

About 20 minutes

Lab/Activity

- Install an External Disk Drive
- Connect a Camcorder

Section 5.5: Input Devices

Preparation

This section covers the different types of devices used to input data into a computer. Students will learn how to select and connect various types of input devices.

A+ Essentials Objectives

- 1.1 Identify the fundamental principles of using personal computers
 - Identify the names, purposes and characteristics of input devices for example: mouse, keyboard, bar code reader, multimedia (e.g. web and digital cameras, MIDI, microphones), biometric devices, touch screen.
 - Identify the names, purposes and characteristics of ports and cables, for example: PS2/Mini-DIN
- 1.2 Install, configure, optimize and upgrade personal computer components
 - Add, remove and configure basic input and multimedia devices

Lecture Focus Questions:

- What are the advantages of using a laser mouse over one with a roller ball?
- What are the important things to remember when cleaning a mouse?
- When selecting a keyboard, what are some of the special features available you could consider?
- What are the types of touch screens? How are they different?

Time

About 20 minutes

Lab/Activity

- Choose a Keyboard
- Choose a Mouse

Section 5.6: Display Devices

Preparation

This section discusses CRT and LCD Monitors. Students will learn how to identify digital and analog connectors by sight, select the appropriate monitor based upon a given scenario, and how to configure display properties in Windows.

A+ Essentials Objectives

- 1.1 Identify the fundamental principles of using personal computers
 - Identify the names, purposes and characteristics of display devices, for example: projectors, CRT and LCD
 - Connector types (e.g. VGA, DVI/HDMI, S-Video, Component/RGB)
 - Settings (e.g. V-hold, refresh rate, resolution)
 - Identify the names, purposes and characteristics of adapter cards
 - Video including PCI/PCIe and AGP Multimedia
- 1.2 Install, configure, optimize and upgrade personal computer components
 - Add, remove and configure internal and external storage devices
 - Drive preparation of internal storage devices including format imaging technology
 - Install display devices
- 2.1 Identify the fundamental principles of using laptops and portable devices
 - Identify names, purposes and characteristics of laptop-specific:
 - LCD technologies (e.g. active and passive matrix, resolution such as XGA, SXGA+, UXGA, WUXGA, contrast ratio, native resolution)

Lecture Focus Questions:

- How does the video card affect the quality of the image on the monitor?
- What terms are used to rate the quality of monitors?
- What feature of a non-interlaced monitor makes it a better quality than an interlaced monitor?
- What is the difference between composite and component video?
- Which connectors are used for a digital video-analog signal? Which connectors provide only a digital signal?
- What are the advantages of dual link cables over single link cables?

Time

About 20 minutes

Lab/Activity

- Install a CRT Monitor
- Connect an LCD Monitor
- Choose a Monitor 1
- Choose a Monitor 2
- Install Dual Monitors
- Configure Video Properties

Section 5.7: Sound Devices

Preparation

In this section students will learn about the devices that manage sound input and output. Sound cards are used to convert analog sound into digital data, and digital data into analog sound. The file types for digital audio files and common uses of each file type are discussed. Students will also learn how to visually recognize sound card connectors and ports for proper connection.

A+ Essentials Objectives

- 1.1 Identify the fundamental principles of using personal computers
 - Identify the names, purposes and characteristics of input devices for example: multimedia (e.g. MIDI, microphones).
 - Identify the names, purposes and characteristics of ports and cables, for example: multimedia (e.g. 1/8 connector, MIDI Coaxial, SPDIF)
- 1.2 Install, configure, optimize and upgrade personal computer components
 - Add, remove and configure basic input and multimedia devices

Lecture Focus Questions:

- Which components are used to convert analog sound into digital data, and digital data into analog sound?
- What is the difference between 2.0 (stereo), 5.1, and 7.1 audio?
- What is a sampling rate?
- What is the difference between a WAV file and a MIDI file?
- What two connectors might be used with S/PDIF?
- What is a DB-15 connector on a sound card used for?

Time

About 30 minutes

Section 5.8: Troubleshooting

Preparation

This section discusses troubleshooting common problems with mice, keyboards, USB and Firewire input and output devices, sound boards and video. The steps to troubleshoot are presented. Since video is more complex to troubleshoot than other I/O devices, common video problems are presented along with possible solutions to the problem.

A+ Essentials Objectives

- 1.3 Identify tools, diagnostic procedures and troubleshooting techniques for personal computer components
 - Apply basic troubleshooting techniques to check for problems (e.g. thermal issues, error codes, power, connections including cables and/or pins, compatibility, functionality, software/drivers) with components for example:
 - Display devices
 - Input devices
 - Adapter cards

Lecture Focus Questions:

- What is the most common problem with mice and keyboards?
- What can be done to make sure USB devices have sufficient power?
- What is color shift? How can you eliminate it?
- What are the most common causes of blurry images?
- What causes a computer to use interlace mode? How can it be corrected?

Time

About 50 minutes

Section 6.1: Storage Devices

Preparation

This section presents an overview of long-term storage devices; floppy disk, hard disk, optical discs, flash devices, and tape drives. Students will also learn the advantages and disadvantages of common storage device interfaces.

A+ Essentials Objectives

- 1.1 Identify the fundamental principles of using personal computers
 - Identify the names, purposes and characteristics of storage devices
 - FDD
 - HDD
 - CD/DVD/RW (e.g. drive speeds, media types)
 - Removable storage (e.g. tape drive, solid state such as thumb drive, flash and SD cards, USB, external CD-RW and hard drive)

Lecture Focus Questions:

- What are the advantages of hard disks over all other forms of storage media?
- How do optical drives store and read data from a disc?
- How does a flash device differ from a floppy disk or a hard disk?
- How does SATA improve upon the limitations of ATA?
- How is configuring SATA easier than configuring ATA?
- What is a typical application for SCSI devices?
- Which type of interface would you commonly use to attach a flash card reader to the computer?

Time

About 65 minutes

Section 6.2: Floppy

Preparation

This section covers the basics of floppy drives. Though floppies have changed very little over the years, they are still useful for transferring small files, booting a new system, and creating rescue or restore disks used for troubleshooting system problems.

A+ Essentials Objectives

- 1.1 Identify the fundamental principles of using personal computers
 - Identify the names, purposes and characteristics of storage devices
 - FDD

Lecture Focus Questions:

- What are the common uses for floppy drives on modern computers?
- Why should magnets be kept away from floppy disks?
- What should be done if an error indicating that the disk is unreadable or unformatted is displayed?
- What method do you use to clean the read/write heads of the floppy disk?

Time

About 20 minutes

Section 6.3: Hard Drives

Preparation

This section presents an overview of hard disk drives. The role and function of hard drives is discussed as well as the components and mechanisms used for reading, writing, and storing data. The different types of partitions, disks and volumes are presented. Students will learn how to create primary and extended partitions, upgrade a basic disk to a dynamic disk, and to create dynamic volumes.

A+ Essentials Objectives

- 1.1 Identify the fundamental principles of using personal computers
 - Identify the names, purposes and characteristics of storage devices
 - HDD
- 1.2 Install, configure, optimize and upgrade personal computer components
 - Add, remove and configure internal and external storage devices
 - Drive preparation of internal storage devices including format imaging technology

Lecture Focus Questions:

- What is the difference between a hard disk sector and a track?
- How does disk caching improve performance?
- How is a disk drive prepared before an operating system can be installed?
- What measures are used to describe hard drive performance?
- What is the relationship between a partition and the drive letter?
- What is the difference between basic and dynamic disks?

Time

About 70 minutes

Lab/Activity

- Create a Primary Partition
- Create a Logical Drive
- Create a Simple Volume

Section 6.4: Optical Media

Preparation

This section presents an overview of the basics of CD and DVD discs and drives. Students will learn about the different compact disc formats available and the general purpose and specific standards of each. They will also learn what factors to consider when selecting an optical drive.

A+ Essentials Objectives

- 1.1 Identify the fundamental principles of using personal computers
 - Identify the names, purposes and characteristics of storage devices
 - CD/DVD/RW (e.g. drive speeds, media types)

Lecture Focus Questions:

- What does the book color of the compact disc formats identify?
- What is the difference between DVD-R and DVD+R? Are the two standards compatible?
- What precautions should you take when working with CDs?
- An optical drive speed is identified as 24x10x70. What does each of the numbers indicate?
- How do you prevent buffer underrun errors?

Time

About 35 minutes

Section 7.1: Networking Overview

Preparation

In this section students will learn the basics of networking. This includes the components that make up a network, the role of the networks, different types of networks, the protocols used to communicate on a network, and three forms of network communication.

A+ Essentials Objectives

- 5.1 Identify the fundamental principles of networks
 - Describe basic networking concepts
 - Bandwidth
 - Protocols (e.g. TCP/IP including IP, classful subnet, IPX/SPX including NWLINK, NETBEUI/NETBIOS)
 - Full-duplex, half-duplex
 - Networking models including peer-to-peer and client/server
 - Identify names, purposes and characteristics (e.g. definition, speed and connections) of technologies for establishing connectivity for example:
 - LAN/WAN

Lecture Focus Questions:

- In what ways does a network benefit a company? What's the main drawback to implementing a network?
- Why are *protocols* important for networking?
- What are the advantages of a client/server network when compared to a peer-to-peer network?
- What is TCP/IP most commonly used for?

Time

About 40 minutes

Section 7.2: Connection Hardware

Preparation

This section overviews the different media used to connect devices into a network. Students will become familiar with common cable types and connectors. This includes discussions on coaxial, twisted pair, and fiber optic cable. Students will learn how to select the appropriate network card, cable, and connector type for a given network and how to install a network card.

A+ Essentials Objectives

- 5.1 Identify the fundamental principles of networks
 - Describe basic networking concepts
 - Cabling (e.g. twisted pair, coaxial cable, fiber optic, RS-232, USB, IEEE 1394/Firewire)
 - Identify names, purposes and characteristics of the common network cables
 - Plenum/PVC
 - UTP (e.g. CAT3, CAT5 / 5e, CAT6)
 - STP
 - Fiber (e.g. single-mode and multi-mode)
 - Identify names, purposes and characteristics of network connectors (e.g. RJ45 and RJ11, ST/SC/LC, MT-RJ)
- 5.2 Install, configure, optimize and upgrade networks
 - Install and configure network cards (physical address)

Lecture Focus Questions:

- What is the role of the network interface card (NIC)?
- Why are wires twisted together in twisted pair cables?
- What is the difference between STP and UTP cabling?
- What is the difference between Cat3 and Cat5 cable?
- Which connector type and cable grade is used to connect a cable modem to the Internet connection?
- What advantages do fiber optic cables offer over twisted pair or other media choices? What are the disadvantages to implementing fiber optic cables?
- What is the difference between single mode and multi-mode cables?
- How can you tell the difference between an ST and an SC connector?

Time

About 70 minutes

Lab/Activity

- Install and Connect a Modem
- Connect to an Ethernet Network

Section 7.3: Addressing

Preparation

In this section students will learn about network addressing. All network devices use addresses to send and receive data across the network. Two main categories of addressing are used. A physical hardware address is a unique hardware address that is burned into the ROM of the chip on the network board by the manufacturer. It cannot be changed. The logical address is an address that can be assigned and is based upon the network protocol being used such as IP or IPX.

A+ Essentials Objectives

- 5.1 Identify the fundamental principles of networks
 - Describe basic networking concepts
 - Addressing
 - Protocols (e.g. TCP/IP including IP, classful subnet)

Lecture Focus Questions:

- What is the difference between a MAC address and an IP address? Which address can you assign to a computer?
- How does the IP address indicate both the network and the node address? What is used to identify each part of the address?
- What is the address class of IP address 133.66.155.189?
- What is the default subnet mask for the IP address 166.88.1.45? What is the network address? What is the host address?
- What happens to the MAC address when you move a computer to another network?

Time

About 45 minutes

Section 7.4: Internet Connectivity

Preparation

This section discusses the different methods used to connect to the Internet. Students will learn how to select and install networking hardware for Internet connectivity. They will also learn how to configure a dial-up connection in Windows.

A+ Essentials Objectives

- 5.1 Identify the fundamental principles of networks
 - Identify names, purposes and characteristics (e.g. definition, speed and connections) of technologies for establishing connectivity for example:
 - ISDN
 - Broadband (e.g. DSL, cable, satellite)
 - Dial-up
 - Wireless (all 802.11)
 - Infrared
 - Bluetooth
 - Cellular
 - VoIP
- 5.2 Install, configure, optimize and upgrade networks
 - Install, identify, and obtain wired and wireless connection

Lecture Focus Questions:

- In which situations would a PSTN still be the best Internet option? Why?
- How does DSL enable you to talk on the phone and connect to the Internet at the same time?
- What is the difference between BRI and PRI service levels when dealing with ISDN Internet?
- What is the main drawback to cable Internet?
- What is required for a satellite Internet connection?

Time

About 45 minutes

Lab/Activity

- Connect to a DSL Network
- Create a Dialup Internet Connection

Section 7.5: Firewalls

Preparation

This section discusses how a firewall works and different types of firewalls. Firewalls are critical in protecting networks and computers from the many threats that exist in today's computing environments. Students will learn how to configure the Windows firewall.

A+ Essentials Objectives

- 6.1 Identify the fundamental principles of security
 - Identify names, purposes and characteristics of hardware and software security for example:
 - Software firewalls

Lecture Focus Questions:

- Why is using a firewall important when connecting your computer to the Internet?
- Is the Windows firewall service a host-based or a network-based firewall solution?
- What information does the firewall use to allow or prevent communication?
- What are the disadvantages to using a firewall?

Time

About 30 minutes

Lab/Activity

- Configure the Windows Firewall

Section 7.6: Wireless Networking

Preparation

In this section students will learn the basics of wireless networking. They will become familiar with the radio frequency wireless networking standards: 802.11a, 802.11b, and 802.11g. They will discover the devices used on a wireless network, different connection methods available, and the importance of securing a wireless network. Students will learn how to create a wireless connection.

A+ Essentials Objectives

- 5.1 Identify the fundamental principles of networks
 - Identify names, purposes and characteristics (e.g. definition, speed and connections) of technologies for establishing connectivity for example:
 - Wireless (all 802.11)
 - Infrared
 - Bluetooth
- 5.2 Install, configure, optimize and upgrade networks
 - Install, identify and obtain wired and wireless connection
- 6.1 Identify the fundamental principles of security
 - Identify names, purposes and characteristics of wireless security for example:
 - Wireless encryption (e.g. WEP.x and WPA.x) and client configuration
 - Access points (e.g. disable DHCP/use static IP, change SSID from default, disable SSID broadcast, MAC filtering, change default username and password, update firmware, firewall)

Lecture Focus Questions:

- What type of device is required to create an infrastructure wireless network configuration?
- What is the purpose of an SSID?
- Why should default security settings be changed when dealing with wireless networking?
- What is *snorting* and what can be done to prevent it?

Time

About 75 minutes

Lab/Activity

- Create a Wireless Connection
- Use WPA Encryption

Section 7.7: Troubleshooting

Preparation

This section presents troubleshooting techniques that can be used to troubleshoot network problems. These include a checklist of the most obvious items to examine such as connection status, speed, network mode, and driver. It also discusses how to interpret the activity of the status indicator light on the network card.

A+ Essentials Objectives

- 5.1 Identify the fundamental principles of networks
 - Describe basic networking concepts
 - Status indicators
- 5.3 Identify tools, diagnostic procedures and troubleshooting techniques for networks
 - Explain status indicators, for example: speed, connection and activity lights and wireless signal strength

Lecture Focus Questions:

- What might cause the problem of a link light that does not come on?
- What is the first thing you should try if the link light is not lit? What should you try next?
- Why would the activity light be flashing when no information is being sent on the network?
- What should you do if the activity light is constantly flashing?
- What should you try if all of the computers on the network are having the same problem?

Time

About 20 minutes

Section 8.1: Printers

Preparation

This section presents an overview of the basics of printers. This includes six types of printers and how they print, printer interfaces used to connect a printer to a PC, and the factors that should be considered when purchasing a printer. Students will learn how to choose and install the appropriate printer using the correct cabling, connectors, and ports.

A+ Essentials Objectives

- 4.1 Identify the fundamental principles of using printers and scanners
 - Identify differences between types of printer and scanner technologies (e.g. laser, inkjet, thermal, solid ink, impact)
 - Identify names, purposes and characteristics of printer and scanner components (e.g. memory, driver, firmware) and consumables (e.g. toner, ink cartridge, paper)
 - Identify the names, purposes and characteristics of interfaces used by printers and scanners including port and cable types for example:
 - Parallel
 - Network (e.g. NIC, print servers)
 - USB
 - Serial
 - IEEE 1394/firewire
 - Wireless (e.g. Bluetooth, 802.11, infrared)
 - SCSI

Lecture Focus Questions:

- Which printer type is ideal for printing carbon-copy documents?
- What is a common application for a thermal printer?
- What features are used to describe the quality and speed of print jobs a printer can produce?
- Why does a laser printer use heat in the printing process?
- What are the two most common printer interfaces?
- How can memory improve the performance of your printer?

Time

About 60 minutes

Lab/Activity

- Choose a Printer 1
- Choose a Printer 2

Section 8.2: Printer Configuration

Preparation

This section discusses basic printing concepts in Windows 2000 and Windows XP. The critical difference between Windows XP/2000 and earlier versions of Windows is that the printer is not an actual physical device, but the printer is a logical printer consisting of the print device, printer driver and print spooler. Students will learn how to install a plug-and-play printer, manually install a printer, and set and change the default printer.

A+ Essentials Objectives

- 4.2 Identify basic concepts of installing, configuring, optimizing and upgrading printers and scanners
 - Install and configure printers/scanners
 - Power and connect the device using local or network port
 - Install and update device driver and calibrate the device
 - Configure options and default settings
 - Print a test page
 - Optimize printer performance for example, printer settings such as tray switching, print spool settings, device calibration, media types and paper orientation

Lecture Focus Questions:

- How is a printer a logical device?
- What is the function of the print driver? The print queue?
- Which printing component takes the print job from the queue and sends it to the print device?

Time

About 50 minutes

Lab/Activity

- Install a Plug and Play Printer
- Manually Install a Printer
- Change the Default Printer

Section 8.3: Network Printing

Preparation

In this section students get a high-level overview of network printing. They will learn how to share a local printer as a network printer and how to configure a printer on a workstation by pointing to a network print device.

A+ Essentials Objectives

- 4.2 Identify basic concepts of installing, configuring, optimizing and upgrading printers and scanners

Lecture Focus Questions:

- What is the benefit of network printing?
- What is the purpose of the print server?
- Which type of devices can act as a print server?
- What is an advantage of having a printer with a built-in print server and network interface?

Time

About 30 minutes

Lab/Activity

- Share a Local Printer
- Add a Network Printer

Section 8.4: Troubleshooting Printing

Preparation

This section discusses common printing problems that cause about 50% of printing problems. Because there is such a wide variety of printers on the market, students need to learn to visit the manufacturer's Web site and check the knowledgebase or Frequently Asked Questions (FAQs) for specific details about printers.

A+ Essentials Objectives

- 4.3 Identify tools, basic diagnostic procedures and troubleshooting techniques for printers and scanners
 - Gather information about printer/scanner problems
 - Identify symptom
 - Review device error codes, computer error messages and history (e.g. event log, user reports)
 - Print or scan test page
 - Use appropriate generic or vendor-specific diagnostic tools including web-based utilities
 - Review and analyze collected data
 - Establish probable causes
 - Review service documentation
 - Review knowledge base and define and isolate the problem (e.g. software vs. hardware, driver, connectivity, printer)
 - Identify solutions to identified printer/scanner problems
 - Define specific cause and apply fix
 - Replace consumables as needed
 - Verify functionality and get user acceptance of problem fix

Lecture Focus Questions:

- What are three obvious things you should check before doing more extensive printing troubleshooting?
- What problems are indicated if the printer can print a test page but you cannot send a print job to the printer from a workstation?
- What problems are indicated if print jobs print using garbled text?
- How does paper quality affect a printer?
- What is the best way to clean up a toner spill?
- How do you clean an ink jet printer head?

Time

About 35 minutes

Section 9.1: Portable Devices

Preparation

This section presents an overview of the common portable device types that are currently available. These include laptops (notebooks), Personal Digital Assistants (PDAs), and Tablet PCs. Portable devices use a credit card sized expansion bus that conforms to PCMCIA standards. Information about providing power for a notebook and different methods to allow portable devices to communicate with a network are also discussed.

A+ Essentials Objectives

- 2.1 Identify the fundamental principles of using laptops and portable devices
 - Identify names, purposes and characteristics of laptop-specific:
 - Form factors such as memory and hard drives
 - Peripherals (e.g. docking station, port replicator and media/accessory bay)
 - Expansion slots (e.g. PCMCIA I, II and III, card and express bus)
 - Ports (e.g. mini PCI slot)
 - Communication connections (e.g. Bluetooth, infrared, cellular WAN, Ethernet)
 - Power and electrical input devices (e.g. auto-switching and fixed-input power supplies, batteries)
 - LCD technologies (e.g. active and passive matrix, resolution such as XGA, SXGA+, UXGA, WUXGA, contrast ratio, native resolution)
 - Input devices (e.g. stylus/digitizer, function (Fn) keys and pointing devices such as touch pad, point stick/track point)
 - Identify and distinguish between mobile and desktop motherboards and processors including throttling, power management and WiFi
- 2.2 Install, configure, optimize and upgrade laptops and portable devices
 - Demonstrate safe removal of laptop-specific hardware such as peripherals, hot-swappable devices and non-hot-swappable devices

Lecture Focus Questions:

- How do you transfer data from a PDA to a desktop computer?
- What is the function of the docking station?
- What kinds of components are typically built into a notebook computer?
- How do you add devices to a portable device?
- What size slot is required for the different types of PC cards?
- What is the battery memory effect that is present in Ni-cad batteries?
- What advantages do NiMH batteries have over Li-Ion batteries?
- How should you dispose of notebook batteries?

Time

About 30 minutes

Section 9.2: Power Management

Preparation

In this section students will learn power management strategies used to reduce the amount of power consumed by computer devices. Power management is even more important with portable computers because of the need to stretch the life of the batteries by not wasting unnecessary power. Students will learn how to create, modify, and save power schemes.

A+ Essentials Objectives

- 2.2 Install, configure, optimize and upgrade laptops and portable devices
 - Configure power management
 - Identify the features of BIOS-ACPI
 - Identify the difference between suspend, hibernate and standby

Lecture Focus Questions:

- What is the difference between APM and ACPI?
- Which ACPI power level saves the contents of RAM onto disk?
- What devices are controlled through Windows Power Schemes?

Time

About 40 minutes

Lab/Activity

- Configure Power Settings
- Exploring Power Schemes
- Create a Power Scheme

Section 9.3: Troubleshooting

Preparation

This section discusses troubleshooting notebook computers. It focuses in on troubleshooting power, video, and input devices. Maintenance measures to prevent problems are also discussed.

A+ Essentials Objectives

- 2.3 Identify tools, basic diagnostic procedures and troubleshooting techniques for laptops and portable devices
 - Use procedures and techniques to diagnose power conditions, video, keyboard, pointer and wireless card issues, for example:
 - Verify AC power (e.g. LEDs, swap AC adapter)
 - Verify DC power
 - Remove unneeded peripherals
 - Plug in external monitor
 - Toggle Fn keys
 - Check LCD cutoff switch
 - Verify backlight functionality and pixilation
 - Stylus issues (e.g. digitizer problems)
 - Unique laptop keypad issues
 - Antenna wires
- 2.4 Perform preventive maintenance on laptops and portable devices
 - Identify and apply common preventive maintenance techniques for laptops and portable devices, for example: cooling devices, hardware and video cleaning materials, operating environments including temperature and air quality, storage, transportation and shipping.

Lecture Focus Questions:

- The LCD screen on your laptop doesn't work, but a monitor connected to the external video port does work. What component has the problem?
- What can you do as a temporary solution if the mouse or keyboard stops working on a laptop?
- How do most laptops allow you to type in numbers similar to the 10-key number pad on a full-sized keyboard?
- What are three things you can do to help keep laptops cool?
- Why is a change in temperature potentially damaging for a laptop?

Time

About 50 minutes

Section 10.1: System Files

Preparation

In this section students learn about the Windows 2000 and Windows XP system files used to boot the system. They will also learn about the Windows registry, which stores hardware and software settings for the Windows operating system. Students are cautioned to be very careful when editing the registry because it may negatively affect the functionality of the workstation. Students will learn how to back up, modify, and restore the registry.

A+ Essentials Objectives

- 3.1 Identify the fundamentals of using operating systems
 - Identify names, purposes and characteristics of the primary operating system components including registry
 - Identify the names, locations, purposes and characteristics of operating system files for example:
 - BOOT.INI
 - NTLDR
 - NTDETECT.COM
 - NTBOOTDD.SYS
 - Registry data files

Lecture Focus Questions:

- What tasks does the NTLDR file perform?
- When is the NTBOOTDD.SYS file used?
- Which file identifies hardware and loads that information into the registry?
- What tests are performed during POST?
- What are the recommended methods for editing the registry?
- Why is creating a registry backup so important?

Time

About 40 minutes

Section 10.2: System Restore

Preparation

This section focuses on two disaster recovery tools used to restore operating system files in case of a disaster. System Restore is a service of Windows XP that monitors system files and some applications and takes a snapshot (restore point) of the system files before changes are made to the files. It can be used to restore a system to a state that was saved as a restore point previous to a change that has negatively affected the system. Automated System Recovery (ASR) is a last-resort method of backing up and restoring the operating system and should be used only after backups and system restore points have failed. The students will learn how to create a system restore point and restore a computer to a restore point.

A+ Essentials Objectives

- 3.3 Identify tools, diagnostic procedures and troubleshooting techniques for operating systems
 - Identify basic boot sequences, methods and utilities for recovering operating systems
 - Automated System Recovery (ASR) (e.g. Emergency Repair Disk (ERD))
- 3.4 Perform preventive maintenance on operating systems
 - Describe common utilities for performing preventive maintenance on operating systems for example, software and Windows updates (e.g. service packs), scheduled backups/restore, restore points

Lecture Focus Questions:

- What are three actions that you take that might trigger a restore point being made?
- What is the minimum disk space required to use System Restore? What happens when System Restore runs out of free disk space?
- What three things do you need on hand before you can perform an automated system recovery?
- You have implemented a regular schedule for making restore points and creating ASR diskettes. What else must you do to protect the system?

Time

About 45 minutes

Lab/Activity

- Create a Restore Point
- Restore to a Point in Time

Section 10.3: Backup and Restore

Preparation

In this section students will learn how to implement backup and restore strategies to protect data. Three different backup strategies are outlined along with the characteristics for both backup and restore of each strategy. Students will learn how to use the NTBACKUP utility to backup data, how to schedule a backup, how to restore data from a backup, and the restore options that are available.

A+ Essentials Objectives

- 1.3 Identify tools, diagnostic procedures and troubleshooting techniques for personal computer components
 - Recognize the basic aspects of troubleshooting theory for example:
 - Perform backups before making changes
- 3.3 Identify tools, diagnostic procedures and troubleshooting techniques for operating systems
 - Identify the names, locations, purposes and characteristics of operating system utilities for example:
 - Disk management tools (e.g. NTBACKUP)
- 3.4 Perform preventive maintenance on operating systems
 - Describe common utilities for performing preventive maintenance on operating systems for example, scheduled backups/restore

Lecture Focus Questions:

- What is the difference between a full + incremental backup and a full + differential backup?
- Why can't you combine incremental and differential backup methods?
- Which backup methods do not reset the Archive bit?
- Where should backup media be stored for maximum security?
- Why should you test your restore methods?

Time

About 40 minutes

Section 10.4: System Updates

Preparation

This section discusses updating the operating system using hotfixes and service packs. Automatic Update is a Windows feature used to automatically download and install updates. Students will learn how to enable Automatic Updates and configure Automatic Update settings.

A+ Essentials Objectives

- 3.4 Perform preventive maintenance on operating systems
 - Describe common utilities for performing preventive maintenance on operating systems for example, software and Windows updates (e.g. service packs)
- 6.4 Perform preventive maintenance for computer security
 - Implement software security preventive maintenance techniques such as installing service packs and patches and training users about malicious software prevention technologies

Lecture Focus Questions:

- What is the difference between a hotfix and a service pack?
- What should you do if you need to install service pack 2 but haven't yet installed service pack 1?
- What are two reasons why updates are released for the operating system?
- How does keeping system software up to date increase security?
- Which update setting would be appropriate if you wanted to review the list of updates before they are installed?
- Why are end users not always dependable when it comes to installing updates on their computers?
- In addition to using Automatic Updates, what else should you do to make sure that all application and driver files are updated?

Time

About 15 minutes

Lab/Activity

- Configure Automatic Updates

Section 11.1: Software Security

Preparation

This section focuses on malware security issues. Malware is malicious code that is designed to compromise an enduser's personal data or an organization's intellectual property. Current malware threats may include a virus, worm, Trojan horse, logic bomb, spyware, adware, and spam. Students will become familiar with countermeasures to protect against malware including how to configure virus scanning software.

A+ Essentials Objectives

- 6.1 Identify the fundamental principles of security
 - Identify names, purposes and characteristics of hardware and software security for example:
 - Malicious software protection (e.g. viruses, Trojans, worms, spam, spyware, adware, grayware)
- 6.2 Install, configure, upgrade and optimize security
 - Install, configure, upgrade and optimize hardware, software and data security for example:
 - Malicious software protection
- 6.3 Identify tool, diagnostic procedures and troubleshooting techniques for security
 - Diagnose and troubleshoot hardware, software and data security issues for example:
 - Malicious software
- 6.4 Perform preventive maintenance for computer security
 - Implement software security preventive maintenance techniques such as installing service packs and patches and training users about malicious software prevention technologies

Lecture Focus Questions:

- How is adware different from spyware?
- How are most viruses transmitted? How can this be prevented?
- What is the best way to protect against trojans?
- What is the most important thing to remember when trying to prevent spam?
- Why are virus definition files important? Why should they be kept up-to-date?

Time

About 35 minutes

Section 11.2: Social Engineering

Preparation

In this section students learn how to prevent social engineering. By recognizing the different schemes that are used to fraudulently acquire sensitive information employees can become aware of how to respond appropriately to these attacks.

A+ Essentials Objectives

- 6.1 Identify the fundamental principles of security
 - Describe importance and process of incidence reporting
 - Recognize and respond appropriately to social engineering situations

Lecture Focus Questions:

- What characteristics of human nature does social engineering exploit?
- Who is usually the target in social engineering?
- How can dumpster diving give attackers valuable information?
- What is the best defense against a social engineering attack?

Time

About 20 minutes

Section 11.3: System Security

Preparation

This section discusses using the Windows Local Security Policy. Students will learn how to configure the Local Security Policy settings to control how the system behaves and what users can do. Students will also become aware of security issues of current authentication threats and the countermeasures to improve security.

A+ Essentials Objectives

- 6.1 Identify the fundamental principles of security
 - Identify names, purposes and characteristics of hardware and software security for example:
 - Smart cards/biometrics (e.g. key fobs, cards, chips and scans)
 - Authentication technologies (e.g. user name, password, biometrics, smart cards)
 - Identify names, purposes and characteristics of data and physical security
 - Encryption technologies
 - Password management
- 6.2 Install, configure, upgrade and optimize security
 - Install, configure, upgrade and optimize hardware, software and data security for example:
 - Smart cards
 - Authentication technologies
 - Data access (basic local security policy)
- 6.3 Identify tool, diagnostic procedures and troubleshooting techniques for security
 - Diagnose and troubleshoot hardware, software and data security issues for example:
 - Smart cards, biometrics
 - Authentication technologies
 - Data access (e.g. basic local security policy)

Lecture Focus Questions:

- What is the difference between password policy settings and account lockout settings?
- How can you use user rights to control the type of operations that users can perform?
- What happens to the local security policy settings when the computer is a member of the domain?

- What is the best way to prevent password cracking? How can account lockout help?
- How could smart cards improve the security of an organization?
- What are common biometric identification systems?

Time

About 45 minutes

Lab/Activity

- Configure Policies
- Enforce Password Settings

Section 11.4: Physical Security

Preparation

This section presents suggestions on how to physically secure network and computer systems. Students will also learn how to set a password to protect a screen saver and how to configure BIOS security.

A+ Essentials Objectives

- 6.1 Identify the fundamental principles of security
 - Identify names, purposes and characteristics of hardware and software security for example:
 - Hardware deconstruction/recycling
 - Identify names, purposes and characteristics of data and physical security
 - Encryption technologies
 - Backups
 - Data migration
 - Data/remnant removal
 - Locking workstation (e.g. hardware, operating system)
- 6.2 Install, configure, upgrade and optimize security
 - Install, configure, upgrade and optimize hardware, software and data security for example:
 - BIOS
 - Backup procedures and access to backups
 - Data migration
 - Data/remnant removal
- 6.3 Identify tool, diagnostic procedures and troubleshooting techniques for security
 - Diagnose and troubleshoot hardware, software and data security issues for example:
 - BIOS
 - Backup
 - Data migration

Lecture Focus Questions:

- How can additional security be implemented for a critical server?
- Why do removable media drives pose a security threat?
- Why doesn't deleting files from a hard disk offer sufficient protection against disclosure?
- Why is user training important to security?
- Where should tape backups be stored?

Time

About 60 minutes

Lab/Activity

- Require a Screen Saver Password
- Configure BIOS Security

Section 12.1: Installation

Preparation

In this section students will learn how to install and/or upgrade Windows XP. Compatibility issues, hardware requirements, and available installation methods are presented. Students will also learn how to change the boot order of devices in the BIOS.

A+ Essentials Objectives

- 3.2 Install, configure, optimize and upgrade operating systems—references to upgrading from Windows 95 and NT may be made
 - Identify procedures for installing operating systems including:
 - Verification of hardware compatibility and minimum requirements
 - Installation methods (e.g. boot media such as CD, floppy or USB, network installation, drive imaging)
 - Operating system installation options (e.g. attended/unattended, file system type, network configuration)
 - Disk preparation order (e.g. start installation, partition and format drive)
 - Device driver configuration (e.g. install and upload device drivers)
 - Identify procedures for upgrading operating systems including:
 - Upgrade considerations (e.g. hardware, application and/or network compatibility)
 - Implementation (e.g. backup data, install additional Windows components)

Lecture Focus Questions:

- Where can the latest HCL be found? Why is it important to check it?
- What is necessary to successfully install an operating system using an image?
- Which systems can be upgraded to Windows XP?
- What is the difference between a clean install and an upgrade?
- Why is it important to backup files for an upgrade as well as a clean install?

Time

About 70 minutes

Lab/Activity

- Change the Boot Order

Section 12.2: Post Installation

Preparation

This section discusses important steps to complete after installing Windows. Students will also learn how to install optional Windows operating system components.

A+ Essentials Objectives

- 3.2 Install, configure, optimize and upgrade operating systems—references to upgrading from Windows 95 and NT may be made
 - Identify procedures for installing operating systems including:
 - Device driver configuration (e.g. install and upload device drivers)
 - Verification of installation
 - Identify procedures for upgrading operating systems including:
 - Implementation (e.g. install additional Windows components)

Lecture Focus Questions:

- Why is making sure the most updated device drivers are installed so important?
- What is necessary to successfully activate Windows XP?
- What are two security measures you should put into place following installing Windows?
- How many ERD/ASR diskettes are necessary in a corporate network?
- What can you do to make sure the operating system is kept up-to-date?

Time

About 25 minutes

Lab/Activity

- Install Windows Components

Section 13.1: Video Optimization

Preparation

In this section students learn how to optimize performance of a video subsystem under Windows XP by upgrading the hardware and configuring the visual settings in Windows XP. Students will practice configuring the refresh rate and visual settings to customize the operating system.

A+ Essentials Objectives

- 1.2 Install, configure, optimize and upgrade personal computer components
 - Install display devices

Lecture Focus Questions:

- Which type of system bus provides the best performance for video?
- How will more RAM on a video card affect its performance?
- What is the benefit of using a high refresh rate? What happens if the monitor is driven past its capacity?
- What is video acceleration? How can modifying the acceleration settings eliminate video problems?

Time

About 35 minutes

Lab/Activity

- Optimize Video Settings
- Configure Visual Effects

Section 13.2: Memory Optimization

Preparation

This section teaches how virtual memory is used to optimize memory in the system. Students will learn the difference between physical memory and virtual memory and how virtual memory works. Students will learn how to check memory usage in Task Manager, configure virtual memory settings, and create a swap file.

A+ Essentials Objectives

- 3.1 Identify the fundamentals of using operating systems
 - Identify names, purposes and characteristics of the primary operating system components including virtual memory
- 3.2 Install, configure, optimize and upgrade operating systems—references to upgrading from Windows 95 and NT may be made
 - Identify procedures and utilities used to optimize operating systems for example, virtual memory

Lecture Focus Questions:

- What is the benefit of virtual memory?
- How does virtual memory work? What is the purpose of swapping?
- What is the benefit of a separate partition for the swap file?
- Is a low number of page faults a bad thing? Why?
- What condition causes disk thrashing? How can you reduce its effects?

Time

About 35 minutes

Lab/Activity

- Configure Virtual Memory

Section 13.3: Disk Optimization

Preparation

This section discusses how to optimize disk performance. The features to consider when upgrading the hard disk and disk interface are presented. Students will learn how to check a hard disk for errors, defragment a hard disk, and perform Disk Cleanup.

A+ Essentials Objectives

- 3.2 Install, configure, optimize and upgrade operating systems—references to upgrading from Windows 95 and NT may be made
 - Identify procedures and utilities used to optimize operating systems for example, hard drives, temporary files
- 3.3 Identify tools, diagnostic procedures and troubleshooting techniques for operating systems
 - Identify the names, locations, purposes and characteristics of operating system utilities for example:
 - Disk management tools (e.g. DEFRAG)

Lecture Focus Questions:

- What tasks does Disk Cleanup perform?
- Why does fragmentation take place?
- How does defragmenting improve how a system performs?
- What is a *lost cluster*?
- How is a *cross-linked file* resolved?

Time

About 45 minutes

Lab/Activity

- Use Disk Cleanup

Section 13.4: Cooling

Preparation

In this section students will learn various methods to keep PC systems cool. The CPU, hard drive, memory and video board all produce heat that can cause the system to overheat. Students will learn factors to be considered and procedures to implement in order to prevent the overheating of PC systems.

A+ Essentials Objectives

- 1.1 Identify the fundamental principles of using personal computers
 - Identify the names, purposes and characteristics of cooling systems for example heat sinks, CPU and case fans, liquid cooling systems, thermal compound

Lecture Focus Questions:

- How does adequate cooling improve performance and extend the life of components?
- How does organizing and attaching cables and wires in and around a computer system help with internal airflow?
- Why should you keep the system case cover on during normal operations?
- When might you want to add liquid cooling to a computer?
- What is the difference between a heat sink and a heat spreader?
- What is the function of a thermal pad? When should it be used?

Time

About 20 minutes

Section 14.1: System Errors and Lockups

Preparation

This section discusses how to troubleshoot system errors and lockups. Students will learn the three different types of Windows Lockups, possible causes of each, and how to troubleshoot these lockups. They will learn how to use the Device Manager in Windows to roll back a system to a previous version of a device driver. They will also learn how to configure Windows Reporting options.

A+ Essentials Objectives

- 1.3 Identify tools, diagnostic procedures and troubleshooting techniques for personal computer components
 - Recognize and isolate issues with display, power, basic input devices, storage, memory, thermal, POST errors (e.g. BIOS, hardware)
 - Apply basic troubleshooting techniques to check for problems (e.g. thermal issues, error codes, power, connections including cables and/or pins, compatibility, functionality, software/drivers)
- 3.3 Identify tools, diagnostic procedures and troubleshooting techniques for operating systems
 - Recognize and resolve common operational issues such as bluescreen, system lock-up, input/output device, application install, start or load and Windows-specific printing problems (e.g. print spool stalled, incorrect/incompatible driver for print)
 - Identify tools, diagnostic procedures and troubleshooting techniques for operating systems
 - Explain common error messages and codes for example:
 - Windows reporting

Lecture Focus Questions:

- What are the most common types of crashes?
- What types of things should be recorded when a crash occurs? Why is this so important?
- What sources are available for reference if common troubleshooting doesn't provide an answer?
- How can driver rollback help you recover from system instability problems?
- Which type of components does Windows Reporting monitor for errors?

Time

About 40 minutes

Lab/Activity

- Roll Back a Driver
- Configure Windows Reporting

Section 14.2: Startup Errors

Preparation

This section focuses on common startup error messages and error codes. Common causes of each are discussed as well as suggested resolutions. Students will also learn how to boot the system in an alternative mode to resolve startup problems.

A+ Essentials Objectives

- 3.3 Identify tools, diagnostic procedures and troubleshooting techniques for operating systems
 - Identify basic boot sequences, methods and utilities for recovering operating systems
 - Boot methods (e.g. safe mode, recovery console, boot to restore point)
 - Recognize and resolve common operational issues such as bluescreen, system lock-up, input/output device, application install, start or load and Windows-specific printing problems (e.g. print spool stalled, incorrect/incompatible driver for print)
 - Explain common error messages and codes for example:
 - Boot (e.g. invalid boot disk, inaccessible boot drive, missing NTLDR)
 - Startup (e.g. device/service failed to start, device/program in registry not found)
 - Event Viewer
 - Registry

Lecture Focus Questions:

- What are the most common causes for a **Missing NTLDR** error message?
- Under which conditions would using Last Known Good be helpful? When would it not help to resolve the problem?
- What is the difference between Safe Mode and Enable VGA Mode?
- What type of actions can you take in Safe Mode to help resolve startup problems?

Time

About 60 minutes

Section 14.3: System Recovery

Preparation

In this section the students will learn different methods to recover from a system failure. A variety of last resort disaster recovery tools are discussed including Recovery Console, and Automated System Recovery. Also discussed are parallel installations in which a second copy of Windows is installed on the same system. This allows you to boot the system even when the original installation is corrupt. Several other methods to recover from system problems are listed. Students will learn how to install the Recovery Console to a local disk, boot the system into the Recovery Console, and use commands to correct system errors.

A+ Essentials Objectives

- 3.2 Identify tools, diagnostic procedures and troubleshooting techniques for operating systems
 - Identify basic boot sequences, methods and utilities for recovering operating systems
 - Boot methods (e.g. safe mode, recovery console, boot to restore point)
 - Automated System Recovery (ASR) (e.g. Emergency Repair Disk (ERD))
 - Explain common error messages and codes for example:
 - Boot (e.g. invalid boot disk, inaccessible boot drive, missing NTLDR)
 - Startup (e.g. device/service failed to start, device/program in registry not found)

Lecture Focus Questions:

- When should the Recovery Console be used in the recovery process? Which other things should you try first?
- Why is authentication so important with the Recovery Console?
- How does installing the Recovery Console before a system crash expedite the troubleshooting process?
- What are the two ways that a parallel installation can be performed?
- What are the benefits of parallel installation? What are the drawbacks?

Time

About 30 minutes