



# San Joaquin County Office of Education

## Career & Technical Education

A+ Certification ~ Course Outline

CBEDS#: 5558

### *A+ Certification Course Outline*

		Classroom
1	Installation, Configuration and Upgrading	54
	<p>This unit teaches knowledge and skills to identify, install, configure, and upgrade desktop computer modules and peripherals, following established procedures for system assembly and disassembly of field replaceable modules.</p> <ul style="list-style-type: none"><li>• Identify basic terms, concepts, and functions of system modules, including how each module should work during normal operation and during the boot process.<ul style="list-style-type: none"><li>➤ System board</li><li>➤ Power supply</li><li>➤ Processor/CPU</li><li>➤ Memory</li><li>➤ Storage devices</li><li>➤ Monitor</li><li>➤ Modem</li><li>➤ Firmware</li><li>➤ BIOS</li><li>➤ CMOS</li><li>➤ LCD (portable systems)</li><li>➤ Ports</li><li>➤ PDA (Personal Digital Assistant)</li></ul></li><li>• Identify basic procedures for adding and removing field replaceable modules for both desktop and portable systems.<ul style="list-style-type: none"><li>➤ System board</li><li>➤ Storage device</li><li>➤ Power supply</li><li>➤ Processor/CPU</li><li>➤ Memory</li><li>➤ Input devices</li><li>➤ Hard drive</li><li>➤ Keyboard</li><li>➤ Video board</li><li>➤ Mouse</li><li>➤ Network Interface Card (NIC)</li><li>➤ Portable systems<ul style="list-style-type: none"><li>○ AC adapter</li><li>○ Digital camera</li><li>○ DC controller</li></ul></li></ul></li></ul>	



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	<ul style="list-style-type: none"><li><ul style="list-style-type: none"><li>○ LCD panel</li><li>○ PC card</li><li>○ Pointing devices</li></ul></li><li>• Identify available IRQs, DMAs, and I/O addresses and procedures for device installation and configuration.<ul style="list-style-type: none"><li>➤ Standard IRQ settings</li><li>➤ Modems</li><li>➤ Floppy drive controllers</li><li>➤ Hard drive controllers</li><li>➤ USB ports</li><li>➤ Infrared ports</li><li>➤ Hexadecimal addresses</li></ul></li><li>• Identify common peripheral ports, associated cabling, and their connectors.<ul style="list-style-type: none"><li>➤ Cable types</li><li>➤ Cable orientation</li><li>➤ Serial versus parallel</li><li>➤ Pin connections (DB-9, DB-25, RJ-11, RJ-45, BNC, PS2/MINI-DIN, USB, IEEE 1394)</li></ul></li><li>• Identify proper procedures for installing and configuring IDE/EIDE/SATA devices.<ul style="list-style-type: none"><li>➤ Master and slave</li><li>➤ Devices per channel</li><li>➤ Primary and secondary</li><li>➤ Hard drive</li><li>➤ Low level format</li><li>➤ Data recovery</li><li>➤ Ghost</li><li>➤ Forensics</li></ul></li><li>• Identify proper procedures for installing and configuring SCSI devices.<ul style="list-style-type: none"><li>➤ Address and termination conflicts</li><li>➤ Cabling</li><li>➤ Types (example: regular, wide, ultra-wide)</li><li>➤ Internal versus external</li><li>➤ Expansion slots, EISA, ISA, PCI</li><li>➤ Jumper block settings (binary equivalents)</li></ul></li><li>• Identify proper procedures for installing and configuring peripheral devices.<ul style="list-style-type: none"><li>➤ Monitor Video Card</li><li>➤ Modem</li><li>➤ USB peripherals and hubs</li><li>➤ IEEE 1284</li></ul></li></ul>	
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	<ul style="list-style-type: none"> <li>➤ IEEE 1394</li> <li>➤ External storage</li> <li>➤ Portable systems               <ul style="list-style-type: none"> <li>○ Docking stations</li> <li>○ PC cards</li> <li>○ Port replicators</li> <li>○ Infrared devices</li> </ul> </li> <li>• Identify hardware methods of upgrading system performance, procedures for replacing basic subsystem components, unique components and when to use them.               <ul style="list-style-type: none"> <li>➤ Memory</li> <li>➤ Hard drives</li> <li>➤ CPU</li> <li>➤ Upgrading BIOS</li> <li>➤ Portable systems                   <ul style="list-style-type: none"> <li>○ Battery</li> <li>○ Hard drive</li> <li>○ Types I, II, III cards</li> <li>○ Memory</li> </ul> </li> </ul> </li> </ul>	
2	Diagnosing and Troubleshooting	54
	<p>This unit teaches knowledge relating to diagnosing and troubleshooting common module problems and system malfunctions. This includes knowledge of the symptoms relating to common problems.</p> <ul style="list-style-type: none"> <li>• Identify common symptoms and problems associated with each module and how to troubleshoot and isolate the problems.               <ul style="list-style-type: none"> <li>➤ Processor and memory symptoms</li> <li>➤ Mouse</li> <li>➤ Floppy drive</li> <li>➤ Parallel ports</li> <li>➤ Hard drives</li> <li>➤ CD-ROM</li> <li>➤ DVD</li> <li>➤ Sound card and audio</li> <li>➤ Monitor and video</li> <li>➤ Motherboards</li> <li>➤ Modems</li> <li>➤ BIOS</li> <li>➤ USB</li> <li>➤ NIC</li> <li>➤ CMOS</li> <li>➤ Power supply</li> <li>➤ Slot covers</li> </ul> </li> </ul>	



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	<ul style="list-style-type: none"> <li>➤ POST audible/visual error codes</li> <li>➤ Troubleshooting tools (multi-meter)</li> <li>➤ Large LBA, LBA</li> <li>➤ Cables</li> <li>➤ Keyboard</li> <li>➤ Peripherals</li> <li>• Identify basic troubleshooting procedures and how to elicit problem symptoms from customers. <ul style="list-style-type: none"> <li>➤ Troubleshooting/isolation/problem determination procedures</li> <li>➤ Determine whether hardware or software problem</li> <li>➤ Gather information from user</li> <li>➤ Customer environment</li> <li>➤ Symptoms and error codes</li> <li>➤ Situation when the problem occurred</li> </ul> </li> </ul>	
3	Preventive Maintenance	8
	<p>This unit teaches safety and preventive maintenance.</p> <ul style="list-style-type: none"> <li>• Identify the purpose of various types of preventive maintenance products and procedures and when to use them. <ul style="list-style-type: none"> <li>➤ Liquid cleaning compounds</li> <li>➤ Types of materials to clean contacts and connections</li> <li>➤ Non-static vacuums (chassis, power supplies, fans)</li> </ul> </li> <li>• Identify issues, procedures and devices for protection within the computing environment, including people, hardware and the surrounding workspace. <ul style="list-style-type: none"> <li>➤ UPS (Uninterruptible Power Supply) and suppressors</li> <li>➤ Determining the signs of power issues</li> <li>➤ Proper methods of storage of components for future use</li> <li>➤ Potential hazards and proper safety procedures relating to lasers</li> <li>➤ High-voltage equipment</li> <li>➤ Power supply</li> <li>➤ CRT</li> <li>➤ Special disposal procedures that comply with environmental guidelines. <ul style="list-style-type: none"> <li>○ Batteries</li> <li>○ CRTs/LCDs</li> <li>○ Toner kits/cartridges</li> <li>○ Chemical solvents and cans</li> <li>○ MSDS (Material Safety Data Sheet)</li> </ul> </li> <li>➤ ESD (Electrostatic Discharge) precautions and procedures <ul style="list-style-type: none"> <li>○ What ESD can do, how it may be apparent, or hidden</li> <li>○ Common ESD protection devices</li> <li>○ Situations that could present a danger or hazard</li> </ul> </li> </ul> </li> </ul>	



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4	<b>Motherboard/Processor/Memory</b>  This unit teaches specific terminology, facts, ways and means of dealing with classifications, categories and principles of motherboards, processors, and memory in desktop computer systems. <ul style="list-style-type: none"> <li>• Distinguish between popular CPU chips in terms of basic characteristics.               <ul style="list-style-type: none"> <li>➤ Popular CPU chips (Intel, AMD, Cyrix)</li> <li>➤ Characteristics</li> <li>➤ Physical size</li> <li>➤ Voltage</li> <li>➤ Speeds</li> <li>➤ Cache</li> <li>➤ Sockets</li> <li>➤ SEC (Single Edge Contact)</li> </ul> </li> <li>• Identify the categories of RAM (Random Access Memory) terminology, their locations, and physical characteristics.               <ul style="list-style-type: none"> <li>➤ Terminology                   <ul style="list-style-type: none"> <li>○ EDO RAM (Extended Data Output RAM)</li> <li>○ DRAM (Dynamic Random Access Memory)</li> <li>○ SRAM (Static RAM)</li> <li>○ RIMM (Rambus Inline Memory Module 184 Pin)</li> <li>○ VRAM (Video RAM)</li> <li>○ SDRAM (Synchronous Dynamic RAM)</li> <li>○ WRAM (Windows Accelerator Card RAM)</li> <li>○ DDR</li> </ul> </li> <li>➤ Locations and physical characteristics                   <ul style="list-style-type: none"> <li>○ Memory bank</li> <li>○ Memory chips (8-bit, 16-bit, and 32-bit)                       <ul style="list-style-type: none"> <li>◆ SIMMS (Single In-line Memory Module)</li> <li>◆ DIMMS (Dual In-line Memory Module)</li> <li>◆ Parity chips versus non-parity chips</li> </ul> </li> </ul> </li> </ul> </li> <li>• Identify the most popular type of motherboards, their components, and architecture (bus structures &amp; power supplies).               <ul style="list-style-type: none"> <li>➤ Motherboard Form Factor</li> <li>➤ Components                   <ul style="list-style-type: none"> <li>○ Communication ports</li> <li>○ SIMM and DIMM</li> <li>○ Processor sockets</li> </ul> </li> <li>➤ External cache memory (Level 2)</li> <li>➤ Bus Architecture</li> </ul> </li> </ul>	30



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	<ul style="list-style-type: none"> <li>○ ISA</li> <li>○ PCI</li> <li>○ PCIE</li> <li>○ AGP</li> <li>○ USB (Universal Serial Bus)</li> <li>○ VESA local bus (VL-Bus)</li> <li>➤ Basic compatibility guidelines               <ul style="list-style-type: none"> <li>○ IDE (ATA, ATAPI, ULTRA-DMA, EIDE)</li> <li>○ SCSI (Wide, Fast, Ultra, LVD (Low Voltage Differential))</li> <li>○ SATA</li> </ul> </li> <li>• Identify purpose of CMOS (Complementary Metal-Oxide Semiconductor), what it contains and how to change its basic parameters.               <ul style="list-style-type: none"> <li>➤ Printer parallel port: Uni-directional, bi-directional, disable and enable, ECP, EPP</li> <li>➤ COM/serial port-memory address, interrupt request, disable</li> <li>➤ Floppy drive-enable/disable drive or boot, speed, density</li> <li>➤ Hard drive-size and drive type</li> <li>➤ Memory-parity, non-parity</li> <li>➤ Boot sequence</li> <li>➤ Date/Time</li> <li>➤ Passwords                   <ul style="list-style-type: none"> <li>○ Plug and Play BIOS</li> </ul> </li> </ul> </li> </ul>	
5	Printers	16
	<p>This unit teaches basic types of printers, basic concepts, and printer components, how they work, how they print onto a page, paper path, care and service techniques, and common problems.</p> <ul style="list-style-type: none"> <li>• Identify basic concepts, printer operations and printer components.               <ul style="list-style-type: none"> <li>➤ Paper feeder mechanisms</li> <li>➤ Types of printers                   <ul style="list-style-type: none"> <li>○ Laser</li> <li>○ Inkjet</li> <li>○ Dot matrix</li> </ul> </li> <li>➤ Types of printer connections and configurations                   <ul style="list-style-type: none"> <li>○ Parallel</li> <li>○ Network</li> <li>○ USB</li> <li>○ Infrared</li> <li>○ Serial</li> </ul> </li> </ul> </li> <li>• Identify care and service techniques and common problems with primary printer types.               <ul style="list-style-type: none"> <li>➤ Feed and output</li> <li>➤ Errors (printed or displayed)</li> </ul> </li> </ul>	



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	<ul style="list-style-type: none"> <li>➤ Paper jam</li> <li>➤ Print quality</li> <li>➤ Safety precautions</li> <li>➤ Preventative maintenance</li> </ul>	
6	Operating System Fundamentals	54
	<p>This unit teaches This unit teaches underlying DOS (Command prompt functions) in Windows Operating System. Windows operating systems in terms of its functions and structure, for managing files and directories, and running programs. It also includes navigating through the operating system from command line prompts and Windows procedures for accessing and retrieving information.</p> <ul style="list-style-type: none"> <li>• Identify the operating system's functions, structure, and major system files to navigate the operating system and how to get to needed technical information.             <ul style="list-style-type: none"> <li>➤ Major operating system functions</li> <li>➤ Create folders</li> <li>➤ Checking operating system version</li> <li>➤ Major operating system components                 <ul style="list-style-type: none"> <li>○ Explorer</li> <li>○ My Computer</li> <li>○ Control Panel</li> </ul> </li> <li>➤ Contrasts between different Windows Operating Systems</li> <li>➤ Major system files (what they are, where they are located, how they are used, what they contain)                 <ul style="list-style-type: none"> <li>○ System, configuration, and user interface files</li> <li>○ IO.SYS</li> <li>○ BOOT.INI</li> <li>○ WIN.COM</li> <li>○ MSDOS.SYS</li> <li>○ AUTOEXEC.BAT</li> <li>○ CONFIG.SYS</li> <li>○ COMMAND LINE PROMPT</li> </ul> </li> <li>➤ Memory management                 <ul style="list-style-type: none"> <li>○ Conventional</li> <li>○ Extended/upper memory</li> <li>○ High memory</li> <li>○ Virtual memory</li> <li>○ HIMEM.SYS</li> <li>○ EMM386.exe</li> </ul> </li> <li>➤ Windows 9x                 <ul style="list-style-type: none"> <li>○ IO.SYS</li> <li>○ WIN.INI</li> </ul> </li> </ul> </li> </ul>	



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	<ul style="list-style-type: none"> <li>○ USER.DAT</li> <li>○ SYSEDIT</li> <li>○ SYSTEM.INI</li> <li>○ SETVER.EXE</li> <li>○ SMARTDRV.EXE</li> <li>○ MSCONFIG (98)</li> <li>○ COMMAND.COM</li> <li>○ DOSSTART.BAT</li> <li>○ REGEDIT.EXE</li> <li>○ SYSTEM.DAT</li> <li>○ RUN COMMAND</li> <li>○ Drive space</li> <li>➤ Windows Operating System <ul style="list-style-type: none"> <li>○ Computer management</li> <li>○ BOOT.INI</li> <li>○ REGEDT32</li> <li>○ REGEDIT</li> <li>○ RUN CMD</li> <li>○ NTLDR</li> <li>○ NTDETECT.COM</li> <li>○ NTBOOTDD.SYS</li> </ul> </li> <li>➤ Command prompt procedures (command syntax) <ul style="list-style-type: none"> <li>○ DIR</li> <li>○ ATTRIB</li> <li>○ VER</li> <li>○ MEM</li> <li>○ SCANDISK</li> <li>○ DEFRAG</li> <li>○ EDIT</li> <li>○ XCOPY</li> <li>○ COPY</li> <li>○ FORMAT</li> <li>○ FDISK</li> <li>○ MSCDEX</li> <li>○ SETVER</li> <li>○ SCANREG</li> </ul> </li> <li>• Identify basic concepts and procedures for creating, viewing, and managing files, directories, and disks. This includes procedures for changing file attributes and ramifications of those changes (for example, security issues). <ul style="list-style-type: none"> <li>➤ File attributes (read only, hidden, system, archive attributes)</li> <li>➤ File naming conventions (most common extensions)</li> </ul> </li> </ul>	
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	<ul style="list-style-type: none"> <li>➤ Windows Operating System</li> <li>➤ IDE and SCSI</li> <li>➤ Internal and external</li> <li>➤ Backup and restore</li> <li>➤ SATA</li> <li>➤ Partitioning, formatting, file system <ul style="list-style-type: none"> <li>○ FAT</li> <li>○ FAT16</li> <li>○ FAT32</li> <li>○ NTFS4</li> <li>○ NTFS5</li> <li>○ HPFS</li> </ul> </li> <li>➤ Windows-based utilities <ul style="list-style-type: none"> <li>○ ScanDisk</li> <li>○ Device manager</li> <li>○ System manager</li> <li>○ Computer manager</li> <li>○ MSCONFIG.EXE</li> <li>○ REGEDIT.EXE (view information/backup registry)</li> <li>○ REGEDIT32.EXE</li> <li>○ ATTRIB.EXE</li> <li>○ EXTRACT.EXE</li> <li>○ DEFRAG.EXE</li> <li>○ EDIT.COM</li> <li>○ FDISK.EXE</li> <li>○ SYSEDIT.EXE</li> <li>○ SCANREG</li> <li>○ WSCRIPT.EXE</li> <li>○ HWINFO.EXE</li> <li>○ ASD.EXE (Automatic Skip Driver)</li> <li>○ Cvt1.EXE (Drive Converter FAT 16 to FAT 32)</li> </ul> </li> </ul>	
7	Installation, Configuring and Upgrading	30
	<p>This unit teaches the knowledge of installing, configuring and upgrading Windows Operating System. This includes knowledge of system boot sequences and minimum hardware requirements.</p> <ul style="list-style-type: none"> <li>• Identify the procedures for installing Windows Operating System for bringing the software to a basic operational level. <ul style="list-style-type: none"> <li>➤ Start-up</li> <li>➤ Partition</li> <li>➤ Format drive</li> <li>➤ Loading drivers</li> <li>➤ Run appropriate setup utility</li> </ul> </li> </ul>	



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	<ul style="list-style-type: none"> <li>Identify steps to perform an operating system upgrade. <ul style="list-style-type: none"> <li>➤ Upgrading Windows Operating Systems</li> <li>➤ Replacing Windows Operating Systems</li> <li>➤ Dual boot Operating System</li> <li>➤ Troubleshoot research</li> </ul> </li> <li>Identify the basic system boot sequences and boot methods, including the steps to create an emergency boot disk with utilities installed for Windows Operating Systems <ul style="list-style-type: none"> <li>➤ Startup disk</li> <li>➤ Safe mode</li> <li>➤ MS-DOS mode</li> <li>➤ NTLDR (NT Loader), BOOT.INI</li> <li>➤ Files required to boot</li> <li>➤ Creating emergency repair disk (ERD)</li> </ul> </li> <li>Identify procedures for loading/adding and configuring application device drivers, and the necessary software for certain devices. <ul style="list-style-type: none"> <li>➤ Identify the procedures for installing and launching typical applications. (Note: there is no content related to Windows 3.1)</li> <li>➤ Procedures for set up and configuring Windows printing subsystem.</li> <li>➤ Setting default printer</li> <li>➤ Installing/spool setting</li> <li>➤ Network printing (with help of LAN administration)</li> </ul> </li> </ul>	
8	Diagnosing and Troubleshooting	72
	<p>This unit teaches the ability to apply knowledge to diagnose and troubleshoot common problems. This includes understanding normal operation and symptoms relating to common problems.</p> <ul style="list-style-type: none"> <li>Recognize and interpret the meaning of common error codes and start-up messages from the boot sequence, and identify steps to correct the problems. <ul style="list-style-type: none"> <li>➤ Safe mode</li> <li>➤ No operating system found</li> <li>➤ Error in CONFIG.SYS line XX</li> <li>➤ Bad or missing COMMAND.COM</li> <li>➤ HIMEM.SYS not loaded</li> <li>➤ Missing or corrupt HIMEM.SYS</li> <li>➤ SCSI</li> <li>➤ Swap file</li> <li>➤ NT boot issues</li> <li>➤ Dr. Watson</li> <li>➤ Failure to start GUI</li> <li>➤ Windows Protection Error</li> </ul> </li> </ul>	



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	<ul style="list-style-type: none"> <li>➤ Event Viewer — Event log is full</li> <li>➤ A device referenced in SYSTEM.INI, WIN.INI, Registry is not found</li> <li>• Recognize common problems and determine how to resolve them.               <ul style="list-style-type: none"> <li>➤ Eliciting problem symptoms from customers</li> <li>➤ Having customer reproduce error as part of the diagnostic process</li> <li>➤ Identifying recent changes to the computer environment from the user</li> <li>➤ Troubleshooting Windows-specific printing problems                   <ul style="list-style-type: none"> <li>○ Print spool is stalled</li> <li>○ Incorrect/incompatible driver for print</li> <li>○ Incorrect parameter</li> <li>○ Other common problems</li> </ul> </li> <li>➤ General protection faults</li> <li>➤ Illegal operation</li> <li>➤ Invalid working directory</li> <li>➤ System lock up</li> <li>➤ Sound card, modem, input device</li> <li>➤ Application will not start or load</li> <li>➤ Trouble shooting Network log on</li> <li>➤ TSR (Terminate Stay Resident) programs and virus</li> <li>➤ Applications Program</li> <li>➤ Network connection</li> <li>➤ Viruses and virus types                   <ul style="list-style-type: none"> <li>○ What they are</li> <li>○ Sources (floppy, emails, etc.)</li> <li>○ How to determine presence</li> </ul> </li> </ul> </li> </ul>	
9	Viruses/Spyware	45
	<ul style="list-style-type: none"> <li>• Explain viruses/spyware and how it lands on your computer.               <ul style="list-style-type: none"> <li>➤ Pop ups</li> <li>➤ Screen savers</li> <li>➤ Add on menus</li> <li>➤ Tool bars</li> <li>➤ Email attachments</li> <li>➤ Key logger</li> <li>➤ Instant messaging</li> <li>➤ Inappropriate sites</li> <li>➤ Viruses Removing tools</li> <li>➤ Browser Hijacking</li> <li>➤ Social Networking</li> <li>➤ Malware</li> <li>➤ Recognizing Potential Risks</li> <li>➤ Phishing</li> </ul> </li> </ul>	
10	Basic Networking	18



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	<p>This unit teaches basic network concepts and terminology, ability to determine whether a computer is networked, knowledge of procedures for swapping and configuring network interface cards, and knowledge of the ramifications of repairs when a computer is networked. The scope of this topic is specific to hardware issues on the desktop and connecting it to a network.</p> <ul style="list-style-type: none"><li>• Identify basic networking concepts, including how a network works and the ramifications of repairs on the network.<ul style="list-style-type: none"><li>➤ Installing and configuring network cards</li><li>➤ Network access</li><li>➤ Full-duplex, half-duplex</li><li>➤ Cabling (twisted pair, coaxial, fiber optic, RS-232)</li><li>➤ WIFI</li><li>➤ Ways to network a PC</li><li>➤ Physical network topographies</li><li>➤ Increasing bandwidth</li><li>➤ Loss of data</li><li>➤ Network slowdown</li><li>➤ Infrared</li><li>➤ Hardware protocols</li><li>➤ Data recovery</li><li>➤ Bluetooth</li></ul></li></ul>	
11	Media and Topologies	104
	<ul style="list-style-type: none"><li>• Recognize the following logical or physical network topologies given a schematic diagram or description.<ul style="list-style-type: none"><li>➤ Star/hierarchical</li><li>➤ Bus</li><li>➤ Mesh</li><li>➤ Ring</li><li>➤ Wireless</li></ul></li><li>• Specify the main features of 802.3 (Ethernet), 802.5 (token ring), 802.11 (wireless) and FDDI networking technologies.<ul style="list-style-type: none"><li>➤ Speed</li><li>➤ Access</li><li>➤ Method</li><li>➤ Topology</li><li>➤ Media</li></ul></li><li>• Specify the characteristics (e.g. speed, length, topology, cable type, etc.) of the following.<ul style="list-style-type: none"><li>➤ 802.3 (Ethernet) standards</li><li>➤ 10BASE-T</li></ul></li></ul>	



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	<ul style="list-style-type: none"> <li>➤ 100BASE-TX</li> <li>➤ 10BASE2</li> <li>➤ 10BASE5</li> <li>➤ 100BASE-FX</li> <li>➤ Gigabit Ethernet</li> <li>• Recognize the following media connectors and/or describe their uses.               <ul style="list-style-type: none"> <li>➤ RJ-11</li> <li>➤ RJ-45</li> <li>➤ AUI</li> <li>➤ BNC</li> <li>➤ ST</li> <li>➤ SC</li> </ul> </li> <li>• Choose the appropriate media type and connectors to add a client to an existing network.</li> <li>• Identify the purpose, features, and functions of the following network components.               <ul style="list-style-type: none"> <li>➤ Hubs</li> <li>➤ Switches and bridges</li> <li>➤ Routers</li> <li>➤ Gateways</li> <li>➤ CSU/DSU</li> <li>➤ Network Interface Cards/ISDN adapters/system area network cards</li> <li>➤ Wireless access points</li> <li>➤ Modems</li> </ul> </li> </ul>	
12	Computer Networking	80
	<ul style="list-style-type: none"> <li>• Given an example identify a MAC address.</li> <li>• Identify the seven layers of the OSI model and their functions.</li> <li>• Differentiate between the following network protocols in terms of routing, addressing schemes, interoperability, and naming convention               <ul style="list-style-type: none"> <li>➤ IPX/SPX</li> <li>➤ TCP/IP</li> <li>➤ WEP</li> <li>➤ WPA</li> </ul> </li> <li>• Identify the OSI layers at which the following network components operate.               <ul style="list-style-type: none"> <li>➤ Hubs</li> <li>➤ Switches</li> <li>➤ Bridges</li> </ul> </li> </ul>	



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	<ul style="list-style-type: none"><li>➤ Routers</li><li>➤ Network Interface Cards</li><li>• Define the purpose, function and/or use of the following protocols within TCP/IP.<ul style="list-style-type: none"><li>➤ IP</li><li>➤ TCP</li><li>➤ UDP</li><li>➤ FTP</li><li>➤ TFTP</li><li>➤ SMTP</li><li>➤ HTTP</li><li>➤ HTTPS</li><li>➤ POP3/IMAP4</li><li>➤ TELNET</li><li>➤ ICMP</li><li>➤ ARP</li><li>➤ NTP</li></ul></li><li>• Define the function of TCP/UDP ports. Identify well-known ports.</li><li>• Identify the purpose of the following network services (e.g. DHCP/bootp, DNS, NAT/ICS, WINS, and SNMP).</li><li>• Identify IP addresses (Ipv4, Ipv6) and their default subnet masks.</li><li>• Identify the purpose of subnetting and default gateways.</li><li>• Identify the differences between public vs. private networks.</li><li>• Identify the basic characteristics (e.g. speed, capacity, media) of the following WAN technologies.<ul style="list-style-type: none"><li>➤ Packet switching vs. circuit switching</li><li>➤ ISDN</li><li>➤ FDDI</li><li>➤ ATM</li><li>➤ Frame relay</li><li>➤ Sonet/SDH</li><li>➤ T1/E1</li><li>➤ T3/E3</li><li>➤ OCX</li></ul></li><li>• Define the function of the following remote access protocols and services.<ul style="list-style-type: none"><li>➤ RAS</li><li>➤ PPP</li><li>➤ PPTP</li><li>➤ ICA</li></ul></li><li>• Identify the following security protocols and describe their purpose and function.</li></ul>	
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	<ul style="list-style-type: none"><li>➤ IPsec</li><li>➤ L2TP</li><li>➤ SSL</li><li>➤ Kerberos</li></ul>	
13	Network Implementation	90
	<ul style="list-style-type: none"><li>• Identify the basic capabilities (i.e. client support, file and print services, interoperability, authentication, application support, security) of the following server operating systems.<ul style="list-style-type: none"><li>➤ UNIX/Linux</li><li>➤ Netware</li><li>➤ Windows</li><li>➤ Macintosh</li><li>➤ Wireless security</li></ul></li><li>• Firewalls</li><li>• Identify the basic capabilities of client workstations (i.e., client connectivity, local security mechanisms, and authentication).</li><li>• Identify the main characteristics of VLANs.</li><li>• Identify the main characteristics of network attached storage.</li><li>• Identify the purpose and characteristics of fault tolerance.</li><li>• Identify the purpose and characteristics of disaster recovery</li><li>• Given a remote connectivity scenario (e.g., IP, IPX, dial-up, PPPoE, authentication, physical connectivity) configure the connection.</li><li>• Identify the purpose, benefits and characteristics of using a firewall.</li><li>• Identify the purpose, benefits and characteristics of using a proxy.</li><li>• Given a scenario, predict the impact of a particular security implementation on network functionality (e.g. blocking port numbers, encryption).</li><li>• Given a network configuration, select the appropriate NIC and network configuration settings (DHCP, DNS, WINS, protocols, NETBIOS/host name).</li></ul>	



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		Classroom
14	Network Support	110
	<ul style="list-style-type: none"> <li>Given a troubleshooting scenario, select the appropriate TCP/IP utility from among the following. <ul style="list-style-type: none"> <li>➤ Tracert</li> <li>➤ Ping</li> <li>➤ Arp</li> <li>➤ Netstat</li> <li>➤ Nbtstat</li> <li>➤ Ipconfig</li> <li>➤ Winipcfg</li> <li>➤ Nslookup</li> </ul> </li> <li>Given a troubleshooting scenario involving a small office/home office network failure (e.g. xDSL, cable, home satellite, wireless, POTS), identify the cause of the failure.</li> <li>Given a troubleshooting scenario involving a remote connectivity problem (e.g. authentication failure, protocol configuration, physical connectivity) identify the cause of the problem.</li> <li>Given specific parameters, configure a client to connect to the following servers</li> <li>Given a wiring task, select the appropriate tool (e.g. wire crimper, media tester/certifier, punch down tool, tone generator, optical tester).</li> <li>Given a network scenario, interpret visual indicators (e.g. link lights, collision lights) to determine the nature of the problem.</li> <li>Given output from a diagnostic utility (e.g. tracert, ping, ipconfig), identify the utility and interpret the output.</li> <li>Given a scenario, predict the impact of modifying, adding, or removing network services (e.g. DHCP, DNS, WINS) on network resources and users.</li> <li>Given a network problem scenario, select an appropriate course of action based on a general troubleshooting strategy. This strategy includes the following steps. <ul style="list-style-type: none"> <li>➤ Establish the symptoms</li> <li>➤ Identify the affected area</li> <li>➤ Establish what has changed</li> <li>➤ Select the most probable cause</li> <li>➤ Implement a solution</li> <li>➤ Test the result</li> <li>➤ Recognize the potential effects of the solution</li> <li>➤ Document the solution</li> </ul> </li> </ul>	





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	<ul style="list-style-type: none"><li>• Given a troubleshooting scenario involving a network with a particular physical topology (i.e. bus, star/hierarchical, mesh, ring, wireless) and including a network diagram, identify the network area effected and the cause of the problem.</li><li>• Given a network troubleshooting scenario involving a client connectivity problem (e.g. incorrect protocol/client software/authentication configuration, or insufficient rights/permission), identify the cause of the problem.</li><li>• Given a network troubleshooting scenario involving a wiring/infrastructure problem, identify the cause of the problem (e.g. bad media, interference, network hardware).</li></ul>	
	<b>Total Classroom Hours</b>	<b>720</b>
	<b>Optional Total Community Classroom Hours</b>	<b>180</b>
	<b>Total Course Hours</b>	<b>900</b>