

# FOLSOM CORDOVA UNIFIED SCHOOL DISTRICT

## Detailed Course Outline

July 7, 1999

**COURSE TITLE:** Computer Refurbishing and Repair I & II (SPIRIT)

**SASI:** XXXX

**COURSE DURATION:** 1 Year **NUMBER OF UNITS:** 10

**GRADE LEVEL:** Grades 10 - 12

**PREREQUISITES:**

Knowledge of MS/PC operating systems and knowledge of IBM personal computers, their clones and compatibles. Students must have prior approval of instructor.

**COURSE DESCRIPTION:**

This is an advanced course in computer hardware and configurations. This course introduces students to the WINDOWS 95/98 operating systems in relation to the current business environment and hardware technologies used in these environments. Students will learn to diagnose, troubleshoot, repair, refurbish, upgrade and build PC computer systems. Students will also integrate these computer systems into the classroom environment and provide support to the school.

**EXPECTED STUDENT LEARNING RESULTS and the Technology Student Learning Skills:**

The Folsom Cordova Unified School District has established Expected Student Learning Results (ESLRs) designed to focus our efforts in raising academic standards and technical skills for students. Our effort to raise the standards includes the integration of technology across the curriculum within our ESLRs. FCUSD graduates will be:

**1. Self-Directed Learners who:**

- Accept responsibility for their own learning.
- Identify their needs and apply appropriate learning strategies.
- Monitor, adjust, and document work in progress.
- Set and reach personal goals.
- Apply learning to real world situations.
- Demonstrate the ability to transfer knowledge to new situations.

**2. Effective Communicators who:**

- Express ideas clearly.
- Use verbal, written, artistic, and technological forms of communication.
- Convey messages, ideas, thoughts, feelings, and opinions to others.
- Listen and respond to the messages of others.

**3. Quality Producers/Performers who:**

- Can perceive, define and accomplish intended results.
- Use appropriate resources/technology to complete a task.

- Create projects which reflect originality and high standards.
- Continually assess, evaluate and adjust work to maintain high standards.
- Demonstrate the ability to work both independently and collaboratively.

**4. Constructive Thinkers who:**

- Build meaning and understanding for themselves using prior knowledge and new information.
- Question, analyze, synthesize and evaluate information, as presented in a variety of media.
- Select appropriate resources to gather information.
- Select, monitor and adjust problem-solving strategies.

**5. Collaborative Workers who:**

- Work effectively within culturally and organizationally diverse settings.
- Cooperate with others to initiate, plan and evaluate projects.
- Identify problems and reach consensus and a solution.
- Contribute time, energy and ideas to a group.
- Actively listen to others' opinions, ideas and solutions.

**6. Responsible Citizens who:**

- Contribute time, energy and talents to improve the welfare of themselves and others.
- Abide by school and community rules, laws and regulations.
- Promote and model effective communication between people of different backgrounds, lifestyles, and cultures.
- Demonstrate habits of personal wellness and safety; develop self-discipline.
- Demonstrate respect for the rights and property of others.
- Demonstrate care and respect for the environment.

The following **Technology Student Learning Skills** will be developed to help prepare our students to succeed in a rapidly changing society. These skills are designed to be clear learning targets for students and teachers and are aligned with our ESLRs.

*The student as information navigator, critical thinker and analyzer using technology.*

A. The student will understand and use technology to find information, research subjects, and complete classroom assignments.

*The student as possessor of knowledge using technology, media and telecommunications.*

B. The student will understand and be able to demonstrate understanding of technology to complete classroom assignments.

*The student as effective communicator through a variety of appropriate technology media.*

C. The student will understand and be able to use multimedia applications to complete classroom and public presentations.

*The student as a discriminating selector of appropriate technology for specific purposes*

D. The student will use and understand which communication vehicle is appropriate for completing or communicating classroom assignments.

*The student as technician*

E. The student will demonstrate a high level of technical literacy.

*The student as a responsible citizen, worker, learner, community member and family member in a technological age.*

F. The student will understand the ethical ramifications of using technology.

**STUDENT WRITING EXPECTANCIES:**

A. Students will write detailed descriptions of technical processes used in building a computer and loading software.

B. Students will employ various forms of writing including step-by-step directions, troubleshooting check sheets, inventory management documents, and evaluations of services required to carry out warranty issues with the computers.

C. As students work in teams to develop detailed descriptions of technical processes, they will collaborate, revise and produce a final paper or script that will be used in demonstration videos or CD-ROMs.

D. Students will carefully examine their work for appropriate conventions of the English language.

**UNITS OF INSTRUCTION AND DURATION:**

**Weeks**

<b>1.</b>	<b><i>Introduction to Microcomputers</i></b>	<b>2</b>
<b>2.</b>	<b><i>Safety and Preventive Maintenance</i></b>	<b>2</b>
<b>3.</b>	<b><i>PC Operating Systems</i></b>	<b>4</b>
<b>4.</b>	<b><i>Windows 95/98</i></b>	<b>4</b>
<b>5.</b>	<b><i>Microcomputer Components</i></b>	<b>4</b>
<b>6.</b>	<b><i>Miscellaneous Hardware</i></b>	<b>2</b>
<b>7.</b>	<b><i>Diagnostics, Troubleshooting, Repair</i></b>	<b>6</b>
<b>8.</b>	<b><i>Hardware Installation and Configuration</i></b>	<b>6</b>
<b>9.</b>	<b><i>Communication Skills and Customer Service</i></b>	<b>2</b>
<b>10.</b>	<b><i>Networking Basics and Internet Fundamentals*</i></b>	<b>2</b>

*\*This is an optional unit, typically reserved for 2<sup>nd</sup> year students or the advanced students of this course.*

**Course Goals**

***Students will***

- 1. Explain the basic functions of a microcomputer.*
- 3. Become knowledgeable consumer of computers and related technology products.*
- 3. Know present genre software and hardware compatibility issues.*
- 4. Use appropriate troubleshooting techniques to identify a failing component.*
- 5. Learn the potential hazards when working with electronic devices.*
- 6. Know the bus structure implemented in PCs.*
- 7. Identify types of microprocessors with their connectors to a motherboard.*
- 8. Identify types of memory used on PCs with the error messages associated with each.*
- 9. Know mass data storage devices compatibility issues with operation system Bios.*
- 10. Have a list that optimizes computer assembly and disassembly by type.*
- 11. Be able to install new hardware devices and resolve conflicts in current OS.*
- 12. Be able to install and configure the appropriate OS for available architectures.*
- 13. Be able to successfully build a computer from new parts for Windows 95/98 OS.*
- 14. Be able to successfully refurbish a pre-586 computer for Windows 95 OS.*

15. *Be able to document repair, refurbish, install, and build work orders so that they may be used as an audit trail.*
16. *Be able to communicate effectively with other teachers regarding computer problems.*
17. *Be able to install peripherals for output (printer) and input devices (scanner).*
18. *Configure TCP/IP Internet protocol using Windows 95/98.*
19. *Configure print and files sharing LANs in Windows 3.11 or Windows 95 using 20 appropriate connectivity protocols.*
20. *Evaluate the need for hardware repair or software repair issues.*
21. *Understand current sound/graphic technologies, their use in application software, and their use with Internet plug-ins.*
22. *Be able to install current school application software and understand the software's strengths and weakness.*
23. *Be able to make **master** hard drives and use these for imaging student workstation hard drives.*
24. *Be able to identify basic LAN topologies, protocols, and operating systems that lead to the connection to the Internet.*
25. *Be able to use the appropriate cabling, connectors, and network interface adapters to connect a print sharing, file sharing, and Internet network.*
26. *Be able to describe printer problems associated with each of the major classes of printers.*

## UNIT OBJECTIVES

## DURATION

### **UNIT I INTRODUCTION TO MICROCOMPUTERS      2 Weeks**

#### *Students will*

1. Provide a history of the microcomputer
2. Explain basic functions of a microcomputer: **input, processing output, storage.**
3. Know major differences and evaluate PCs base on **CPU, bus, BIOS, video, ports, memory, hard disk interface and encoding, keyboard, floppy, expansion slots, BIOS configuration method (CMOS/DIP), SCSI host adapter, NIC, CD-ROM, and cache.**
4. Know how to traverse and configure common industry BIOSs: **AMI, Phoenix, Compaq, Award, IBM**
5. Know the evolution of motherboard expansion **bus** architectures and give their advantages: **bus mastering, bus speed, ISA (16bit AT), EISA, PCI, VESA, MCA.**
6. Understand the configuration of the expansion bus through **IRQ, DMA, I/O address, and memory address.**
7. Learn the types of computers and their application by **case** form factor and **power supply** connectivity: **ATX, AT, laptop, palmtop, PDA, desktop, mini-tower, mid-tower, workstation, dumb-terminal, server, mini-computer, main-frame.**
8. Understand the steps in the PC **boot** process including the **Power On Self Test (POST)** and causes of **invalid systems disk errors.**
9. Know the major levels of a memory map and function of each: **conventional, video, extended, expanded, reserved, upper, protected mode.**
10. Know the order of common components loaded into conventional memory: **interrupt vectors, operating systems, device drivers, transient stay resident, applications, data.**
11. Identify, give an example and state the advantage of basic data storage components: **memory, magnetic, optical.**
12. Identify and give the functions of the installable components of a motherboard: **RAM, ROM, CPU socket, edge connectors, jumpers, power connector, controllers, CMOS battery, post connectors for serial, parallel, keyboard, USB devices.**
13. Learn about the bus structure of a motherboard and a CPU: **address bus, data bus, control bus, register bus, bandwidth.**
14. Learn how to calculate **bit, byte, kilobyte, megabyte, gigabyte, terabyte, and exabyte** in decimals notation and **binary** notation.

15. Be given a binary number and convert it to its decimal value.
16. Explain how a computer uses binary digits to represent data in the **ASCII** table.
17. Know categories and purposes of common application software: **word processing, spreadsheet, database management, presentation management, utility programs.**
18. Know and differentiate the common programming environments used to create software: **machine language, assembly, BASIC, Visual BASIC, Pascal, C, and Object Oriented C, HTML, Java Script.**
19. Evaluate video displays and adapters through their **screen resolution (pixels), colors, refresh rate, ramdac, amount and type of RAM.**
20. Understand and make comparisons of common computer speed terminology for computer components: **megahertz (CPU), data storage device access time (milliseconds), RAM access time (nanoseconds).**

## ***UNIT 2 SAFETY and PREVENTIVE MAINTENANCE 2 Weeks***

### ***Students will***

1. Maintain proper work order documentation.
  - a. proper inventory information of each computer.
  - b. build a driver library required for each computer.
  - c. to file problem resolution reports.
  - d. to maintain diagnostic information or sources.
  - e. catalog an file all hardware configuration literature.
2. Document industry standard rules of safety with electronics.
3. Develop a preventive maintenance program for computers.
4. Learn the potential hazards generated by **power supplies, printers, cathode ray tubes, electrical outlets, user-induced power surges, transients.**
5. Know the “duty cycles”, for common PC components.
6. Know the approximate heat ranges for computer components.
7. Know how **Radio Frequency Interference (RFI)** causes problems for computers.
8. Identify by voltages the sources and minimize the sources of **Electrostatic Discharge (ESD).**
9. Identify and minimize the sources of **Electromagnetic Interference (EMI).**
10. Establish a system to dispose of electronic equipment and other hazardous materials.
11. Understand the dangers and how to discharge a **Cathode Ray Tube (CRT)** and a **power supply.** The discharge of a CRT will not be accomplished in the course.
12. Build and follow periodic and preventive maintenance schedules.
13. Establish and maintain levels of spares based upon industry standards: **mean time between failure (MTBF) rates, warranties.**
14. Identify and eliminate environmental hazards related to electronic equipment: **heat, dust, dirt, humidity, water, power, static, magnetic, food/drink spills, radiation, corrosive chemicals.**
15. Implement a virus protection system for non-screened source data.
16. Establish support systems for solving problems and avoiding failures: **users, professionals, on-line tech, documentation.**
17. Know the proper cleaning materials and cleaning methods to be used on PC components.

**UNIT 3PC Operating Systems\***

**4 Weeks**

**Students will**

1. State the purpose of an operating system.
2. Know the current genre, development, and purpose of operating systems: **CPM, UNIX, disk operating system (DOS), OS2, Windows 3.1/3.11, Windows 95/98, LINUX, NT4 Workstation, NT4 Server.**
3. List the files in the boot process and give a function of each: **boot, MSDOS.SYS, IO.SYS, COMMAND.COM, CONFIG.SYS AUTOEXEC.BAT.**
4. Use common internal DOS commands: **DEL, MD, RD, CD, COPY, DIR, REN, DATE, TIME, VER, CLS, TYPE, CON, directory, tree, switch, extension, wildcard.**
5. Know parts of a file structure and conventions for file naming.
6. Know common file extensions and their purpose: **\*.com, \*.exe, \*.bat, \*.sys, \*.dat, \*.ini, \*.txt, \*.doc, \*.bak, \*.ovl, \*.dll, \*.cfg.**
7. Know the functions of the external DOS commands used in file management: **ATTRIB, DELTREE, XCOPY, MOVE, MSD, DISKCOPY, DOSKEY, LABEL, UNFORMAT, UNDELETE.**
8. Know the purpose of the external files required for hard disk optimization and management: **SYS, SCANDISK, FORMAT, FDISK, CHKDSK, DEFRAG, SMARTDRV.**
9. Know what files are used for a CD-ROM installation: **ATAPI driver set \*.SYS (CONFIG.SYS) and MSCDEX.EXE (AUTOEXEC.BAT).**
10. Know the purpose of files used for memory management: **HIMEM.SYS and EMM386.EXE, MEM, MEMMAKER, SIZER, RAMboost, CHKSTATE, SHARE.**
11. Know the different locations of memory available to DOS: **FAT, TSR, UMA, UMB, EMS, XMS, HMA.**
12. Know how to write user configurable files CONFIG.SYS and AUTOEXEC.BAT with the DOS text editor (EDIT) and the functions of each of the following words in these files: **path, echo, mode, rem, set, prompt, device, pause, LPT, COM, files, buffers, high, low, umb, noumb, noems, LASTDRIVE, FCSB.**
13. Know the advantages of Windows as an OS: **GUI, pull-down menu, flexibility, multitasking, common interface and common commands.**
14. The installation of Windows through **setup.exe** and switches and the default program groups. **Accessories, main, start up, games, and applications.**
15. Know the function of PIF and how to create one.
16. Know the functions of special files and file groups used in Windows: **WIN.COM, WIN.CNF, KRNLXXX.EXE, USER.EXE, GDLEXE, WIN.INE, SYSTEM.INI, CONTROL.INI, PROGMAN.INI, WINFILE.INI, \*.SRC, \*.GRP, \*.BMP, \*.SCR, \*.WAV.**
17. Create program manager groups and **icons** for file organization and installation.
18. Understand memory management in Windows: **virtual memory.**
19. Be able to Install external, **printer**, and internal, **display**, hardware devices.
20. Create and set the size of the swap file.
21. Launch DOS applications in Windows: **run, icon, file manager.**
22. Understand causes of **General Protection Fault (GPF)** errors: **Application over-writes used memory area, new hardware added, no or too small of a swap file.**

*\*Objectives 12 to 22 are directly related to the Windows 3.1 operating systems and may be omitted if course does not require a re-visiting of this operating environment.*

## **UNIT 4 WINDOWS 95/98**

**4 Weeks**

### **Students will**

1. Know the new features of Win95/98 and benefits over Win3.1.
2. Know the minimum requirements for installing Windows 95.
3. Perform the installation of Windows 95/98 (with the WIN95/98 \*.cab files copied to the hard drive) and application software.
4. Know the functions of major components of Windows 95/98: **start menu, explorer, taskbar, desktop, properties, shortcuts, control panel, recycle bin, my computer, network neighborhood** and how to customize these components.
5. Know the parts and functions of an **open window. Title bar, menu bar, tool bar, horizontal and vertical scroll buttons, maximize, minimize, zoom, close button.**
6. Know the major components and functions of the **start up menu. Find, run, programs, documents, shut down, accessories, windows explorer.**
7. Identify and know the purpose of major **control panel** icons.
8. Use of pointing device, right click vs. left click and double vs. single and how to navigate the desktop with the keyboard.
9. Make a subdirectory and copy files into it.
10. Install a printer and view the print queue, delete a **spooling** file.
11. Know the function of the **F5** and **F8** keys (used to eliminate certain load-up files for boot-up troubleshooting).
12. Manage hardware devices in the **device manager** and resolve conflicts through **safe mode** boot method.
13. Know how to terminate locked applications through **End Task** or a **Shut Down (warm boot).**
14. Know how to access the MSDOS prompt and size the DOS Window for using DOS applications.
15. Know how to change **display settings** configuration of the desktop and be able to unlock the password of a screen saver.
16. Know how to use **system properties** for status information.
17. Know the role of the **registry** in hardware management.
18. Know how to view system **performance** and **general system information** to improve systems efficiency.
19. Know how to use system tools to manage the hard drive problems: **scandisk, defrag, format, swap file.**
20. Know how to **add new hardware, add new software**, use the **conflict troubleshooter.**
21. Know the procedures for **uninstalling** software.
22. Make a multipurpose emergency boot disk.
23. Know functions of user profiles (**USER.DAT**) and hardware profiles (**HARDWARE.DAT**) in the registry and the use of **system policies (POLEDIT)** to override user and hardware profiles.
24. Know how to do basic networking of workstations for print, file, workstation sharing, and apply user-level security.
25. How to use the OS software or third party software to connect to the Internet.
26. How to troubleshoot bad or missing files (command interpreter: MSDOS.SYS), **VFAT initialization**, device driver, and optimize the file system.

## **UNIT 5 MICROCOMPUTER COMPONENTS**

*4 Weeks*

### *Students will*

1. Learn the functions of common **interface devices** and **expansion boards** used on motherboards: **sound, memory, video, network, controller, modem**. Identify common ports, their function, and the connector required for each: **serial, parallel, mouse-com, mouse-PS2, keyboard, game, USB, video, sound, external SCSI, USB, Fire Wire**.
2. Learn common motherboard performance issues: **CPU, BUS, conform factor, connector availability and types, add-ons**
3. Know the 5 basic steps of a CPU's instruction execution: **Fetch, Decode, Get Data, Execute, Write-back results**.
4. Know the main component processes of a **CPU: ALU, FPU, address, control, pipelining, dual pipelining**.
5. Learn the development sequence of the microprocessor by its expansion of its **address bus, data bus, register bus, cache, instruction sets, clock speed**.
6. Identify types of CPU connectors to the motherboard: **DIPP, PGA, SPGA, SEC**.
7. Know the color coding scheme of the voltage connectors of a power supply: **+12, -12, +5, -5**.
8. Trace the evolution of types of **memory** by function, access speed, and packaging: **RAM, ROM, EPROM, DIP, SIMM, DIMM, parity, non-parity, shadow RAM, DRAM, SRAM, SDRAM, FPM, EDO, DDR, VRAM, WRAM, SGRAM, Flash RAM, CMOS**.
9. Describe characteristics of hard disk drives: encoding: **MFM, RLL**, interface: **IDE, UDMA, UATA, SCSI 1, 2 (wide) and 3 (ultra wide)**, geometry: **heads, tracks, sectors, cylinders**, access time: **latency, seek time** data transfer rate: **kbps**, sector interleaves: caching: **disk caching controller, software (SmartDrive)**.
10. Compute hard drive use of the components of hard drive geometry: **Heads, tracks, sectors** in the translation formula.
11. Compare and contrast display monitors in PC applications: **CRT, refresh rates, dot pitch, interlacing, LCD-passive matrix, LCD-active matrix, TFT, power management**.
12. Know and be able to compute the number colors of a video display in binary (**bit color**) format.
13. Identify display adapters by their standard of common supported resolutions, colors, and outputs: **EGA, VGA, VESA, SVGA, XVGA, video RAM, S-video input, NTSC**.
14. Trace the development of **video memory** and its functions: **DRAM, VRAM, WRAM, SGRAM**.
15. Know the characteristics and advantages of the various video file compression formats: **pcx, gif, tiff, bmp, jpg, jpeg**.
16. Identify types of audio adapters, their functions and external/internal connections: **8 – 512 bit FM, line in (microphone), line out (speaker), CD, aux, wavetable, game port, MIDI, CD-ROM controllers**.

## **UNIT 6 MISCELLANEOUS HARDWARE**

*2 Weeks*

### **Students will**

1. Learn functions and maintenance of input devices: **keyboard, mouse, trackball, optical mouse, scanner, light-pen, digitizing tablet, touch screen, game port.**
2. Identify the types of connectors, data cables, and pin configurations, that connect with internal and external devices to the motherboard or interface cards: **DBF, DBM, DIN, BNC, PS2, serial (COM1), serial (RS-232), RJ11, RJ14, RJ45, USB, DIN, mini DIN, Centronics (parallel), miniplug, RCA plug, DBF-15.**
3. Understand the functions, the installation, and features of **modems: synchronous, asynchronous, ISDN, cable, satellite, fax, voice**, speeds (**baud rate**): **56K, CDSL**, data compression (**V90**), communication chip: **UARTS**, error control, connectors: **RJ-11, RJ-14.**
4. Know the multimedia standards: **MPC1, MPC2, MPC3.**
5. Know the video standards connectors to external devices: **AGP, video capture, video conferencing, digital inputs (camera, video recorder.**
6. Know the trends and functioning in data storage devices: **CD-ROM read, CDRW, DVD, tape, QIC, DAT, DLT, Iomega Jazz, removable drive, flash memory.**
7. Identify, state the functions of other computing devices: **portables, laptops, notebooks, PDA, network computer, voice recognition.**
8. Describe the technological principles and advantages of each of the three types of printers: **impact (dot matrix), inkjet, and laser.**
9. The advantages of **LCD** displays for laptops and portable computers. **Active matrix, Passive matrix, Thin Film Transistor.**
10. The types and purposes of **PCMCIA** interface devices used in portable computers 11. and laptops: **Type 1, Type 2, Type 3.**
12. The types, advantages, and care of common portable power technology used in portable computers. **NiCad, NiMH, LI, SmartB.**
13. Know main power management features of portable PCs: **system management mode (SMM), advanced power management (APM).**

**UNIT 7      *DIAGNOSTICS, TROUBLESHOOTING, REPAIR*    6 Weeks Students Will**

1. Determine the cost effectiveness of repairing and upgrading versus purchasing a new system: **build, buy, modify.**
2. Determine differences between hardware and software failure.
3. Keep proper and sufficient tools on hand: **screwdrivers, pliers, cutters, flashlights, extractors, wrist strap, hemostat, multi-meter.**
4. Keep and organize a sufficient *small parts* supply.
5. Learn to diagnose from principle of simple to complicated solutions, do the obvious first.
6. Use the BIOS settings to determine if major hardware components are connected to the motherboard.
7. Log and utilize common troubleshooting tips.
8. Know what makes a motherboard fail.
9. Use system diagnostic utilities and 3<sup>rd</sup> party software packages.
10. Isolate software, **operating system versus application**, to correct configuration malfunctions.
11. Train users to manage their own systems.
12. Establish, document proper procedures for parts-swap-out diagnostics and rules for parts handling diagnostics.
13. Know when to fix or replace a motherboard.
14. Develop error codes checklists for non-functional hardware.
15. Know the SI units of measurement pertinent when diagnosing and repairing PCs.
16. Know the equations for OHM's LAW and the units of measurement for current, resistance, electromotive force, and power settings: **volts, ohms, amperes, watts (volt-amps).**
17. Know the various meters and meter setting used to measure volts, ohms and amperes: **analog, digital.**
18. Know the power consumption of the various components that are supported by the power supply.
19. Know the procedures to measure voltage, current, and resistance using a digital multi-meter and learn the test points on the electronics.
20. Know the steps of the **Power On Self Test (POST)** and the common **POST** error codes.
21. Follow common sense rules for disassembly:
  - a. Use disassembly as a last resort.
  - b. Remove case top and leave power on.
  - c. Use *sufficient force* when disconnecting and removing components.
  - d. Make diagrams of important disconnects and document sequence of disassembly.
  - e. Protect sensitive electronic devices.
  - f. Back up configurations.
  - g. Keep small parts contained.
22. Know how to diagnose errors in power supplies, discharge a power supply, change fuse, replace the whisper fan, and re-connect to case switch.
23. Know how to diagnose errors in disk drives, CD ROM drives, tape drives, controllers, and adapters.
24. Know the procedures for the diagnosis of monitor problems.
25. Know the procedure for the diagnosis of common memory errors and associated beep codes **parity, non-parity.**
26. Know the common modem errors and procedures for diagnosis.
27. Know the procedures for the diagnosis of input devices: **mouse keyboard, and trackball problems.**
28. Know principles and direction of flow of **direct current (DC)** versus **alternating current (AC).**
29. Troubleshoot modems and resolve **IRQ conflicts.**
30. Know how to use a circuit tester to check supply voltage: **neutral, hot, ground.**
31. Know how to remove and insert **DIP, PGA, ZIF socket, SEC** chip types.

**UNIT 8 HARDWARE INSTALLATION  
AND CONFIGURATION**

*Weeks 6*

*Students will*

1. Document the tips and tricks that optimize the process of computer disassembly, installation, and re-assembly.
2. Obtain and understand component instructions found in **manuals, guides, adhesive post-its, flyers.**
3. Know how to insert a CPU, RAM, and set the jumpers for motherboard configurations for the CPU, **bus speed, multiplier,** and **CPU core voltage** when replacing the CPU on a motherboard.
4. Learn how to undertake battery replacement and discharge the CMOS capacitor for unlocking unwanted BIOS settings.
5. To set the CMOS configurations for appropriate motherboard hardware.
6. Use the Internet to obtain configuration software such as **updated drivers** for purposes of timely hardware installation.
7. Know how to properly mount a motherboard in the case and connect **the power, power light, ide lights, led, reset switch, on-off switch, speaker, turbo, and/or key-lock** to the motherboard.
8. Know how to install and configure an **IDE** and **SCSI** hard drive.
9. Know how to add or swap interface boards, posts, and ports and configure them to avoid conflicts with other hardware devices.
10. Know the “1” pin rule when connecting cables and edge connectors.
11. Know how to set the device numbers for more than one SCSI component on a PC system.
12. Know the application of various types of fasteners when installing components: **coarse thread screw, fine thread screws, phillips head, flat head, hex head, TORX, Allen.**
13. Know how to configure the **BIOS** settings to match the devices and components on the computer.
14. Know the appropriate motherboard slots for installing, **8-bit, ISA (16-bit), EISA, MCA, PCI, VESA,** and **AGP** expansion boards.
15. Know how to compare and contrast the use of **IRQs, DMAs, I/O Addresses,** and **Memory Addresses** when installing hardware components.
16. Know the necessary requirements for installing **Plug and Play** devices.
17. Know the necessary steps to install a video card, a sound card, a network card, a modem, a CD-ROM, a scanner, a printer, a hard drive, a floppy drive, tape drive, etc.
18. Know the components of multimedia, install these devices with their appropriate drivers, and configure them to maximize their performance: **sound, video, speaker, CD-ROM, head phone, microphone, camera, game.**
19. Learn to use the system files of the Windows OS, **\*.inf** files, for the installation of component drivers.

**UNIT 9 COMMUNICATION SKILLS/CUSTOMER SERVICE 2 Weeks**

***Students will***

1. Follow the top ten service expectations for support.
2. Develop connections between good support and customer loyalty.
3. Role-play customer interaction skills of technical, troubleshooting, and communication.
4. Develop customer service organization: telephone help, field service support, and depot service.
5. Establish a structure escalation policy.
6. Review all customer related documentation, especially for response times.
7. Maintain an orderly work area.
8. Maintain personal dress and cleanliness.
9. Listen effectively to customer's concerns, issues, and particulars.
10. Use both closed- and open- ended questions so as to gather information.
11. Apply the 5 step ALERT process when faced with an upset customer.
12. Set reasonable expectations for the resources available to you for repair and communicate these to the customer.
13. Perform necessary follow-up activities in a timely manner for the benefit of the repair person, the customer, and the support organization.

**UNIT 10      BASIC NETWORKING/INTERNET  
FUNDAMENTALS**

*4 Weeks*

*Students will*

1. Know the features, and types of **local area networks (LAN)** and **wide area networks (WAN): resource sharing, centralized security, fault tolerance, communication.**
2. Know the components of LAN/WAN: **servers, workstations, shared peripherals, network adapters, cable plant, support hardware.**
3. Know the types of LAN/WAN: **Peer-to-Peer, Client/Server.**
4. Know the seven layers of the **Open Systems Interconnect (OSI)** model and describe the services provided by each layer of the model: **application, presentation, session, transport, network, data link, physical.**
5. Relate the functions of each layer of the OSI model to real-world telecommunication components:
6. Identify five common cable topologies and situations when they are used: **BUS, STAR, RING, MESH, CELLULAR.**
7. Describe 3 characteristics that could affect cabling choice: **bandwidth, EMI, fire protection.**
8. Describe the three common data link protocols: **Ethernet, Token Ring, FDDI.**
9. Differentiate between installations of **twisted pair (TP), unshielded twisted pair (UTP), shielded twisted pair (STP), coaxial cable, fiber optic cable.**
10. Know the differences between Ethernet connectors: **10BaseT-BNC, 10Base5-AUX/DIX, 10BaseT/RJ-45.**
11. Know how to terminate a 10BaseT/RJ-45 cable connector.
12. Describe the characteristics of **Token Ring** data link protocol: **token passing, beaconing, Multi-station Access Unit (MAU).**
13. Know the differences between connectors: **RJ-45, RJ-11, and BNC.**
14. Know the advantages of a **Fiber Distributed Data Interface (FDDI)**: cost, ease of installation, capacity, and attenuation, EMI.
15. Understand the difference between horizontal and vertical **backbone** cabling infrastructure.
16. Know the factors for purchase of **network interface cards (NIC)**: **data link protocol, system bus, cabling.**
17. Know how to install NICs and troubleshoot common installation errors through resolving conflicts of **IRQs, I/O address, DMA, and ROM address.**
18. Know the features of protocols used to connect a network: **TCP/IP, NetBEUI, IPX/SPX, and ATM.**
19. Install and configure a **network adapter (NIC)** in Windows OS through dynamic hosting or static hosting: **subnet mask, default gateway, IP Address, DNS Server IP address.**
20. Know the WAN infrastructure provided by public telecommunications providers.
21. Know the differences of the 3 types of leased public facilities: **public switched analog services, dedicated private lines, and switched digital services.**
22. Know the bandwidth of common private line digital services: **DSO, T-1, T-3.**
23. Know the difference between **circuit switching** and **frame relay switching** of switched digital services.
24. Know the advantages of the various **switched digital services: Switched-56, X.25, ISDN, Frame Relay, Switched Multimegabit Digital Services, Asynchronous Transfer Mode.**
25. Distinguish the basic characteristics of LAN interconnection devices: **repeaters, bridges, routers, brouter, gateways.**
26. Identify the different organizational components that manage the Internet and their relationship to each other: **telecommunication provider (POTS), cable service, Internet service provider (ISP), browser, search engine, local ISP.**
27. Understand the purpose and components of a **4-part octet IP address.**
28. Know the purpose of the **domain name service (DNS)** and the organization of domain names.

29. Identify popular ways of connecting to the Internet: **dial-up, dedicated lines (ISDN, DSL), gateways, cable.**
30. Know common current local, national, international **Internet service providers (ISP)** with an advantage of each.
31. Configure an Internet proxy-server connection and know the function of the **subnet mask, default gateway, host IP, DNS server.**
32. Know common troubleshooting tools and tell what each tool does for Internet connectivity: **WINIPCFG, IPCONFIG, PING, TRACERT.**
33. Identify and give the function of common Internet protocols: **File Transfer Protocol (FTP), Transmission Control Protocol / Internet Protocol (TCP/IP), Hypertext Transfer Protocol (HTTP).**
34. List common services offered over the Internet: **E-mail, instant messenger, Newsgroups, chat rooms, E-commerce.**

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