

EAST HADDAM PUBLIC SCHOOLS

COMPUTER EDUCATION

*PC TROUBLESHOOTING AND REPAIR
CURRICULUM*

Approved by the
East Haddam Board of Education

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East Haddam Board of Education

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Technology Education Committee Members

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Statement of Philosophy

Technology is the use of knowledge and resources to modify the natural environment, satisfy human needs, solve problems and extend human capabilities which improve the quality of life on earth. Technology education is the study of human innovation, which provides an opportunity for students to apply and manage knowledge and resources related to the human made world. It incorporates collaborative, application-oriented, activity-based strategies used to develop creative thinking skills while solving real-world problems. The Technology Education Curriculum of the East Haddam School District prepares students to become lifelong contributing members of our technological society who comprehend the impact of technology and use it to improve the quality of life for all people.

Program Goals

Upon successful completion of this course, students will:

- understand the various hardware components of a PC;
- understand the function of an operating system;
- employ basic techniques to trouble shoot hardware problems; and
- assemble and properly configure a basic windows PC.

Course Description

This course is open to all students. Topics covered include the basic hardware and software of a computer system, i.e. motherboard, video cards, and operating systems. Students will set up a basic computer system, install software and drivers, and resolve conflicts using basic troubleshooting techniques.

PC TROUBLESHOOTING AND REPAIR

CONTENT STANDARD: PURSUING A CAREER IN THE INFORMATION TECHNOLOGY FIELD - TECHNICAL SUPPORT

Performance Standard: Perform hardware and software installation, configuration and upgrades.

Learner Outcomes

The students will:

- identify basic terms, concepts and functions of system modules, including how each module should work during normal operations;
- list the hardware components of a basic computer system and describe the job of each;
- identify the most popular type of motherboards, their components, and their architecture;
- list and identify the components of the computer's mother (Main) board;
- identify the purpose of CMOS, what it contains and how to change its basic parameters;
- demonstrate the ability to change BIOS and jumper settings and explain when and why a change is necessary;
- identify common peripheral ports, associated cabling, and their connectors;
- explain the various I/O interfaces, i.e. serial, parallel, USB and fire wire;
- explain how to determine the proper wattage for peripherals;
- demonstrate the setup of a modem and ISP connection;
- install and troubleshoot common problems associated with floppy drives, zip drives, tape back ups, etc.;
- identify proper procedures for installing and configuring solid-state storage devices;
- identify and install IDE hard drives;
- demonstrate the setup of a SCSI interface and explain the difference between a SCSI and IDE interface;
- identify what RAID is and why businesses use it;
- identify hardware methods of upgrading system performance, procedures for replacing basic subsystem components, unique components and when to use them;
- list and explain the various tools used in hard drive management;
- explain file system management;
- explain the function of the power supply;
- explain the various power connectors and demonstrate how to connect each;
- demonstrate the steps necessary to build a PC including selecting hardware, installing various components including multimedia devices, installing an operating system;
- identify the categories of RAM (Random Access Memory) terminology, their locations and physical characteristics;
- explain physical memory and the difference of each type;
- explain memory management;
- identify basic components, printer operations, and printer components; and
- demonstrate the process of setting up a local, shared and remote printer.

Suggested Activities

- Create a flow chart explaining the basics elements of a computer system, what job each element plays, and how each element interacts with the others.
- Examine the system boards from the instructor's display of a variety of PC workstations and will record at least one unique fact about each of the following types: PC, PC-AT, 386, 486, Pentium I, Pentium II, Pentium III.
- Identify and label on a diagram the various components of a motherboard.
- Use the CMOS setup program to customize the operation and configuration of a PC and replace the CMOS battery.
- Examine the various expansion buses from a display. The student will install the various cards into the proper slots on the other board. The student will complete a worksheet identifying a diagram of each card by name.
- Remove and reinstall the CPU of a workstation PC.
- Format a hard drive, use the FDISK utility to add and remove partitions from a hard drive, use the SCANDISK utility to run a surface scan of the C: drive and use DEFRAG to defragment the C: drive.
- List the importance of backup and data integrity. The student will explain how files are deleted and explain the importance of the FAT file system. The student will use the undelete command to recover files from the FAT file system.
- Remove, reinstall and configure a floppy drive and a CD-ROM drive.
- Install a primary IDE hard drive, a secondary IDE hard drive, and a SCSI hard drive.
- Install and configure a SCSI host adapter. The student will install SCSI devices intentionally creating a chain conflict. The student will demonstrate how to resolve the conflict.
- Install a video adapter card, install drivers for the card and configure the video adapter card.
- Install and configure an IDE CD-ROM drive and describe how to load the device driver for the drive.
- Install a sound card and appropriate drivers. Student will also use the web to locate drivers in the case that the drivers normally included with the card are missing.
- Remove and install the various types of RAM (memory)
- Use the various memory management options of each Windows operating system, reconfigure memory allocations.
- Setup various printers including installing drivers. If the drivers are not available the student will use the web to locate them.

Performance Standard: Perform system operations, monitoring and maintenance.

Learner Outcomes

The students will:

- identify procedures and devices for protection within the computing environment, including people, technology and the eco-system;
- explain the importance of virus protection software and how to keep the software current;
- explain the importance of a backup system and describe a simple backup plan;
- explain the importance of system patches and describe how and where to obtain patches;
- describe the essential ideals behind safe computing;
- identify the operating system's function, structure, and major system files to navigate the operating system and know where to go to get to needed technical information;
- list the various operating systems and the components of each; and
- demonstrate how to configure the Windows 9x operating system.

Suggested Activities

- Create a plan outlining what procedures to follow to ensure that the computer system and its data is kept secure.
- Use the Internet to locate various software upgrades and patches. The student will download and install upgrades and patches.
- List the features of each operating system giving its defining characteristics.
- Install the Windows '95 operating system on a workstation. The student will install the Windows '98 operating system on a workstation. The student will install Windows XP on a workstation.

Performance Standard: Perform troubleshooting.

Learner Outcomes

The students will:

- identify basic troubleshooting procedures and good practices for eliciting problems/symptoms from customers;
- explain the steps for troubleshooting a hardware issue;
- explain the steps and ideology for work and trouble documentation;
- demonstrate and practice safety in the work place;
- identify available IRQs, DMAs, and I/O addresses and procedures for configuring them for device installation;
- demonstrate the procedure for solving IRQ conflicts;
- demonstrate I/O addressing and DMA;
- identify care and service techniques and common problems with primary printer types;
- list and demonstrate the basic troubleshooting steps for laser and inkjet printers;
- demonstrate how to print to a file;
- identify common symptoms and problems associated with each module and how to troubleshoot and isolate the problems;
- explain the boot process and what boot errors can tell in the troubleshooting process;
- explain the steps in disassembling a PC;
- demonstrate troubleshooting the Windows 95 operating system including hardware profiling, device management, startup folder, system files and registry; and
- demonstrate the steps necessary to troubleshoot a communications connection.

Suggested Activities

- Participate in a role-playing scenario where one student is a customer and the other the PC technician. The customer will describe a problem and the technician will ask questions of the customer to determine the true nature of the problem.
- List and explain the troubleshooting process. The student will defend his/her troubleshooting decisions with evidence from good troubleshooting procedures.
- Given number of PCs with various problems, the student will go through the trouble shooting process to determine what is the probable cause of failure. Once the probable cause is determined the student will list the steps necessary to solve the problem. If parts or software are necessary the student will use the Web to find replacement hardware and/or software to address the problem.
- List the safety steps for working with PCs and explain why each step is necessary.
- Use the Device Manager to view the properties of a lab PC. The student will record the IRQ, DMA and I/O address settings for floppy drive, NIC, sound card, keyboard, printer port (LPT1) and direct memory access controller.
- Install an I/O expansion card and trouble shoot conflicts.

PC Troubleshooting and Repair (Cont'd)

Suggested Activities (Cont'd)

- Given PCs with serial and parallel port conflicts, in each case the student will describe the symptoms, use the device manager to discover which device is conflicting with the port and resolve the conflict.
- Trouble-shoot printer problems encountered in a lab demonstration. The student will list the steps taken to diagnose the problem and what information each step provides.
- Install various printers including dot matrix, inkjet and laser.
- Turn on a PC and describe the boot process in detail. The student will then remove various components of the PC and record how this removal affects the boot process.
- Disassemble a PC and list the order of the steps taken to perform the operation.

Evaluation/Student Assessment

Students will be evaluated on their learning through a combination of written assessments, verbal explanations, participation in classroom discussions, and physical demonstrations.

Required Text: *A+ Guide to Hardware: Managing, Maintaining, and Troubleshooting*, second edition by Jean Andrews. Thomson Learning 2003.

Supplemental Materials: *Enhanced A+ Lab Manual for Guide to Managing and Maintaining Your PC*, Enhanced Third Edition by Clint Saxton. Thomson Learning 2001.