COMPUTER REPAIR I

Maintaining and Troubleshooting PCs

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COMPUTER REPAIR I

I. <u>COURSE DESCRIPTION</u>

Computer Repair I is a full year study designed as a course to begin preparing the student for CompTIA's 2009 A+ Essentials (220-701) and Practical Application (220-702) exams. It is a culmination of knowledge obtained from installation, identification, and technological theories. By studying computer repair, the students will not only prepare themselves for the exam, but they will gain a competitive edge in the IT industry—having acquired a firm understanding of the technologies and theories that most PC technicians have abandoned from their educational arsenal.

Students of computer repair will study the beginnings of the subject, and thoroughly explain the PC's necessary components, installation, maintenance, basic electricity, preventive maintenance, and basic troubleshooting skills. The student will also learn how to speak the correct vernacular, as well as how to perform in a professional lab environment.

II. <u>COURSE OBJECTIVES/OUTLINE</u>

A. <u>THE PATH OF THE PC TECH</u>

The student will be able to:

- 1. Demonstrate the importance of skill in managing and troubleshooting PCs. (S8.1.12.B3, S8.2.12.A1, S8.2.12.A2)
- 2. Demonstrate the importance of CompTIA A+ Certification. (S8.1.12.B1)
- 3. Grasp the concept of how to become a certified technician. (S8.1.12.B1)
- 4. Determine which exam they should take depending on the career path they desire. (S8.1.12.B1)

B. OPERATIONAL PROCEDURES

- 1. Demonstrate the true process of how computers work. (S8.1.12.B1, S8.2.12.A2, A3, S8.2.12.B1, B2)
- 2. Deal with customers in a professional manner. (S8.1.12.B2)
- 3. Recognize the importance of appearance, integrity, dependability, and responsibility in the professional workplace. (S8.1.12.B2)
- Explain the necessary steps to take when troubleshooting. (S8.1.12.B9, B10, B11, B12, S8.2.12.B5)

C. THE VISIBLE PC

The student will be able to:

- 1. Identify the PC's internal hardware components and how they connect to the main system board—the motherboard. (S8.2.12.B1, S8.2.12.B2)
- 2. Demonstrate how to interpret machine language—the language of the PC. (S8.1.12.B4)
- 3. Demonstrate the four general steps of how the PC works—Input, processing, output, and storage. (S8.2.12.B1)
- 4. Demonstrate the necessary tools needed for a PC Technician. (S8.1.12.B6)
- 5. Identify all of the legacy, and modern, ports on the back on the PC. (S8.2.12.B1, S8.2.12.B2)

D. <u>DEMONSTRATEING WINDOWS</u>

The student will be able to:

- 1. Demonstrate how to navigate the Windows interface including the Desktop, Explorer, the Taskbar, and Start Menu. (S8.2.12.B1)
- Recognize the various flavors of Windows such as Windows 2000, XP, Vista, and 7. (S8.2.12.B1)
- Demonstrate how to use Windows utilities, such as Administrative Tools, Control Panel, Device Manager, System Tools, the Registry, and the Microsoft Management Console (MMC). (S8.1.12.B2)
- 4. Demonstrate the NTFS file system in full, and how it relates to accounts, groups, and permissions. (S8.1.12.B2)
- 5. Demonstrate the boot process once Windows takes over. (S8.1.12.B2)
- 6. Explain the system partition files and be able to interpret them. (S8.1.12.B2)

E. MICROPROCESSORS

- 1. Explain how a processor works. (S8.2.12.B1, S8.2.12.B2)
- 2. Explain the technologies associated with processors such as throttling, hyper-threading, over-clocking, pipelining, dual-core, multitasking, and cache. (S8.2.12.B1, S8.2.12.C2)
- 3. Convert decimal numbers into binary and vice versa. (S8.1.12.B4)
- 4. Identify and describe the various Intel and AMD processors and their characteristics. (S8.2.12.B2, S8.2.12.C3)
- 5. Identify a processor package and socket, and Demonstrate their visual differences. (S8.2.12.B1)
- 6. Demonstrate the chipset and its function. (S8.2.12.C2)
- 7. Install a processor and cooling system. (S8.2.12.B6, S8.1.12.B2)

F. <u>RAM TECHNOLOGIES</u>

The student will be able to:

- Demonstrate the various RAM technologies such as DDR, DDR2, DDR3, SDRAM, ECC, dual- and triple-channel, parity, buffered, PC Rating, registered, and CAS latency. (S8.2.12.B2, S8.2.12.C2)
- 2. Identify the type of RAM module (SIMM, DIMM, and RIMM), and specify the number of pins. (S8.2.12.B2)
- 3. Calculate the capacity of DIMM modules and how to bank them. (S8.2.12.B3)
- 4. Install RAM properly. (S8.2.12.B6, S8.1.12.B2)
- 5. Troubleshoot and test RAM. (S8.1.12.B10, S8.2.12.B5)

G. BIOS AND CMOS

The student will be able to:

- 1. Demonstrate how the PC communicates with the keyboard. (S8.2.12.B1)
- 2. Demonstrate the concept of BIOS and ROM, and why it is needed in the PC. (S8.2.12.B2)
- 3. Use the CMOS Setup program to make configuration changes. (S8.1.12.B6)
- 4. Differentiate between device drivers and option ROM. (S8.2.12.B2)
- 5. Demonstrate the POST program and how a computer communicates errors through beep codes. (S8.1.12.B10, S8.2.12.C2)
- 6. Explain the boot process. (S8.2.12.B2)

H. EXPANSION BUS

- 1. Demonstrate the structure and function of the expansion bus. (S8.2.12.B2)
- 2. Explain the modern expansion buses used in today's PCs—PCI, AGP, PCI-X, and PCI Express. (S8.2.12.C2, S8.2.12.B2, S8.2.12.B3)
- 3. Explain the purpose of system resources (IRQs, I/O addresses, and DMA) and how they are used within the PC. (S8.1.12.B6, S8.2.12.C2)
- 4. Convert binary to hexadecimal and vice versa. (S8.1.12.B4)
- 5. Install an expansion card. (S8.2.12.B6, S8.1.12.B2)
- 6. Troubleshoot expansion cards. (S8.1.12.B10, S8.2.12.B5)

I. MOTHERBOARDS

The student will be able to:

- 1. Demonstrate how motherboards work. (S8.2.12.B1, S8.2.12.B2)
- 2. Differentiate between the various form factors of motherboards. (S8.1.12.B2, S8.1.12.B2)
- 3. Demonstrate how a chipset works. (S8.2.12.B2)
- 4. Explain the components of a motherboard. (S8.2.12.B2)
- 5. Upgrade and install a motherboard. (S8.2.12.B6, S8.1.12.B2)
- 6. Troubleshoot motherboards. (S8.1.12.B10, S8.2.12.B5)

J. POWER SUPPLIES

The student will be able to:

- 1. Demonstrate how electricity works and how its measured. (S8.2.12.B1)
- 2. Describe how a PC gets its power. (S8.2.12.B2)
- 3. Explain what a multi-meter is and how it is used. (S8.1.12.B2, S8.1.12.B6)
- 4. Explain the need for a surge suppressor and UPS. (S8.1.12.B2)
- 5. Demonstrate the components of the PC's power supply. (S8.2.12.B1)
- 6. Demonstrate the ATX Form Factor and its various versions. (S8.2.12.B2)
- 7. Explain active PFC. (S8.2.12.B2)
- Install, maintain, and troubleshoot power supplies. (S8.2.12.B6, S8.1.12.B2, S8.1.12.B10, S8.2.12.B5)

K. HARD DRIVE TECHNOLOGIES

- 1. Explain how a hard drive works. (S8.2.12.B1, S8.2.12.B2)
- 2. Explain the write pre-compensation cylinder and landing zone. (S8.2.12.B1, S8.2.12.B2)
- 3. Demonstrate the various ATA standards including their connectors, speeds, and technologies such as PIO, INT13 Extensions, DMA, LBA, sector translation, and zone bit recording. (S8.2.12.B1, S8.2.12.B2, S8.2.12.C2)
- 4. Explain the ATAPI standard. (S8.2.12.B1, S8.2.12.B2, S8.2.12.C2)
- 5. Explain Serial ATA and how it is implemented. (S8.2.12.B1, S8.2.12.B2, S8.1.12.B6)
- 6. Explain SCSI and how it is implemented. (S8.2.12.B1, S8.2.12.B2, S8.1.12.B6)
- Explain the concept of RAID, as well as its various levels. (S8.2.12.B1, S8.2.12.B2, S8.1.12.B6)
- 8. Implement RAID. (S8.2.12.B3, S8.2.12.B6)
- 9. Install and connect hard drives. (S8.2.12.B6, S8.1.12.B2)
- 10. Demonstrate how to configure CMOS and Install drivers for hard drives. (S8.1.12.B6)
- 11. Demonstrate the boot order. (S8.2.12.B2)
- 12. Troubleshoot hard drive installation. (S8.1.12.B10, S8.2.12.B5)

L. <u>IMPLEMENTING HARD DRIVES</u>

The student will be able to:

- 1. Demonstrate how to partition hard drives. (S8.2.12.B2)
- 2. Explain the difference between basic disks and dynamic disks. (S8.1.12.B6, S8.2.12.C2)
- 3. Configure dynamic disks. (S8.1.12.B3)
- 4. Format a hard drive and explain the process. (S8.1.12.B3, S8.2.12.B2)
- 5. Explain a hard drive's file system, as well as how files are stored on the hard drive. (S8.2.12.B2)
- 6. Explain the concept of fragmentation. (S8.2.12.B5)
- 7. Partition and format using the Windows Installation CD. (S8.1.12.B3)
- 8. Utilize the Disk Management program in Windows. (S8.1.12.B3)
- 9. Work with Dynamic Drives and Mount Points. (S8.1.12.B3)
- 10. Troubleshoot hard drives. (S8.1.12.B10, S8.2.12.B5)

M. <u>REMOVABLE MEDIA</u>

The student will be able to:

- 1. Demonstrate how floppy drives work. (S8.2.12.B1, S8.2.12.B2)
- 2. Install a floppy drive. (S8.2.12.B6, S8.1.12.B2)
- 3. Demonstrate Flash Memory and the various devices that implement it, such as Thumb Drives and Flash cards. (S8.2.12.B1, S8.2.12.B2, S8.1.12.B6)
- 4. Demonstrate how CD-ROM and DVD-ROM drives work, and explain their various standards (CD-R and CD-RW). (S8.2.12.B1, S8.2.12.B2, S8.1.12.B6)
- 5. Explain Blu-Ray technology and how it is implemented. (S8.2.12.B1, S8.2.12.B2, S8.1.12.B6)
- 6. Install an optical drive. (S8.2.12.B6, S8.1.12.B2)
- 7. Backup files to a CD. (S8.1.12.B3)
- 8. Troubleshoot a removable drive. (S8.1.12.B10, S8.2.12.B5)

III. METHODS OF STUDENT EVALUATION

Students are evaluated using the following criteria:

- 1. Class participation
- 2. Periodic quizzes and tests
- 3. Lab work (Installation and Professionalism)
- 4. Projects
- 5. Notes taken
- 6. Simulations

IV. <u>TEXTBOOKS AND INSTRUCTIONAL MATERIALS</u>

Mike Meyers' CompTIA A+ Guide to Managing & Troubleshooting PCs: Third Edition McGraw Hill, New York, 2010

(Includes teacher edition, resource CD, practice A+ Exam questions, and web resources)

CompTIA A+ Certification 2010 Instructional Videos with Mike Meyers. LearnKey, Utah, 2010

V. <u>INSTRUCTIONAL STRATEGIES</u>

Various teaching methods are used in this course. Instruction will be given using prepared worksheets, class notes, instructional videos, and exercises given from the book. Classroom demonstrations and hands-on lab activities will be included. Group activities and cooperative learning may be used. In addition, the Internet may be used for research and downloading device drivers. Moreover, the students will engage in interactive simulation and games to test their knowledge on the material.

VI. <u>SCOPE AND SEQUENCE CHART</u>

KEY: I = INTRODUCED; D = DEVELOPED IN DEPTH; R = REINFORCED

SKILL TO BE LEARNED	9	10	11	12
Identify all of the major components of a PC system	IDR			
Use the base 2 system to convert binary to decimal	IDR			
Identify and explain the expansion buses within the system	IDR			
Demonstrate how a motherboard works	IDR			
Be able to disassemble and reassemble the PC	IDR			
Be able to properly install individual components such as hard drives, CPUs, RAM, floppy	IDR			
drives, optical drives, power supplies, and expansion cards				
Demonstrate how the PC boots to normal working state	IDR			
Gain an Demonstrateing of troubleshooting a PC problem	ID			
Gain an Demonstrateing of how a power supply works	ID			
Gain an Demonstrateing of electricity	ID			
Differentiate between the types RAM and how RAM functions	IDR			
Gain an Demonstrateing of how a CPU works	IDR			
Explain how hard drives and floppy drives work	IDR			
Be able to partition and format a hard drive	IDR			
Be able to install an optical drive	IDR			
Identify the different form factors of motherboards based on characteristics	IDR			

VII. PACING CHART

Chapter 1: The Path of the PC Tech Week 1

Chapter 1, Lesson 1: The Importance of Becoming Certified Week 1

Chapter 1, Lesson 2: How to Become Certified Week 1

Chapter 2: Operational Procedures Week 2, 3

Chapter 2, Lesson 3: The Professional Tech Week 2

Chapter 2, Lesson 4: Communication Week 2, 3

Chapter 2, Lesson 5: Safety and Tools Week 3

Chapter 3: The Visible PC Week 4, 5, 6, 7

Chapter 3, Lesson 6: How the PC Works Week 4

Chapter 3, Lesson 7: The Complete PC Week 4, 5

Chapter 3, Lesson 8: Inside the System Unit Week 5

Chapter 3, Lesson 9: Disassembling/Assembling a PC Week 6, 7

Chapter 4: Understanding Windows Week 8, 9, 10

Chapter 4, Lesson 10: History of Microsoft Windows Week 8

Chapter 4, Lesson 11: The Windows Interface Week 8, 9

Chapter 4, Lesson 12: Operating System Folders Week 9

Chapter 4, Lesson 13: Tech Utilities Week 10

Chapter 5: Microprocessors Week 11, 12, 13

Chapter 5, Lesson 14: CPU Core Components Week 11

Chapter 5, Lesson 15: Memory Week 11

Chapter 5, Lesson 16: Modern CPUs Week 12

Chapter 5, Lesson 17: Installing CPUs Week 13

Chapter 6: RAM Week 14, 15

Chapter 6, Lesson 18: Understanding DRAM Week 14

Chapter 6, Lesson 19: Types of RAM Week 14

Chapter 6, Lesson 20: Working with RAM Week 15

Chapter 6, Lesson 21: Troubleshooting RAM Week 15

Chapter 7: BIOS and CMOS Week 16, 17

Chapter 7, Lesson 22: Communicating with Devices Week 16

Chapter 7, Lesson 23: CMOS Week 16

Chapter 7, Lesson 24: Power-On Self-Test (POST) Week 17

Chapter 7, Lesson 25: Supporting BIOS Week 17

Chapter 8: Expansion Bus Week 18, 19, 20

Chapter 8, Lesson 26: Structure of the Expansion Bus Week 18

Chapter 8, Lesson 27: Modern Expansion Buses Week 18

Chapter 8, Lesson 28: System Resources Week 19

Chapter 8, Lesson 29: Installing Expansion Cards Week 19, 20

Chapter 8, Lesson 30: Troubleshooting Expansion Cards Week 20

Chapter 9: Motherboards Week 21, 22

Chapter 9, Lesson 31: How Motherboards Work Week 21

Chapter 9, Lesson 32: Upgrading and Installing Motherboards Week 21

Chapter 9, Lesson 33: Troubleshooting Motherboards Week 22

Chapter 9, Lesson 34: *Labeling the Motherboard* Week 22

Chapter 10: Power Supplies Week 23, 24

Chapter 10, Lesson 35: Understanding Electricity Week 23

Chapter 10, Lesson 36: Powering the PC Week 23, 24

Chapter 10, Lesson 37: Installing, Maintaining, & Troubleshooting Power Supplies Week 24

Chapter 11: Hard Drive Technologies Week 25, 26, 27, 28

Chapter 11, Lesson 38: How Hard Drives Work Week 25

Chapter 11, Lesson 39: PATA and SATA Week 25, 26

Chapter 11, Lesson 40: SCSI Week 26

Chapter 11, Lesson 41: RAID Week 26, 27

Chapter 11, Lesson 42: Installing Drives Week 27

Chapter 11, Lesson 43: BIOS Support for Drives Week 27, 28

Chapter 11, Lesson 44: Troubleshooting Drive Installations Week 28

Chapter 12: Implementing Hard Drives Week 29, 30, 31, 32, 33

Chapter 12, Lesson 45: Hard Drive Partitions Week 29

- Chapter 12, Lesson 46: Hard Drive Formatting Week 30
- Chapter 12, Lesson 47: Partitioning & Formatting Process Week 31, 32
- Chapter 12, Lesson 48: Maintaining & Troubleshooting Hard Drives Week 32, 33
- Chapter 13: Removable Media Week 34, 35, 36
- Chapter 13, Lesson 49: Floppy Drives Week 34
- Chapter 13, Lesson 50: Flash Memory Week 34
- Chapter 13, Lesson 51: Optical Media Week 35
- Chapter 13, Lesson 52: Troubleshooting Removable Media Week 36

VIII. STUDENT HANDOUT

COMPUTER REPAIR I

COURSE OVERVIEW

Computer Repair I is a full year study designed as a course to begin preparing the student for CompTIA's A+ Essentials and IT Technician exams. It is a culmination of knowledge obtained from installation, identification, and technological theories. By studying computer repair, the students not only prepare themselves for the exam, but they will gain a competitive edge in the IT industry—having acquired a firm understanding of the technologies and theories that most PC technicians have abandoned from their educational arsenal.

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IX. PROFICIENCIES

- 1. Identify all of the internal and external components of a PC. (S8.2.12.B1)
- 2. Follow lab safety procedures. (S8.1.12.B2)
- 3. Convert decimal numbers into binary and hexadecimal. (S8.1.12.B9)
- 4. Describe the various modules of RAM and be able to explain the technologies associated with them. (S8.2.12.B1, B2)
- 5. Demonstrate the purpose of BIOS and how it assists in communication within the PC. (S8.1.12.B4, S8.2.12.C2)
- 6. Change configuration settings using the CMOS Setup program. (S8.1.12.B3)
- 7. Completely assemble the PC, including installation of all components. (S8.2.12.B6)
- 8. Explain the basics concepts of electricity. (S8.2.12.B2)
- 9. Explain how a hard drive works as well as its associated technologies. (S8.2.12.B1, B2, S8.2.12.C2)
- 10. Explain how a processor works, and identify the current processors used today. (S8.2.12.C2, C3)
- 11. Grasp the basic steps of troubleshooting a PC problem. (S8.1.12.B9, B10)
- 12. Be able to partition and configure hard drives, whether basic or dynamic. (S8.1.12.B3)
- 13. Explain the various expansion buses, as well as install an expansion card. (S8.1.12.B6)