

# Computer Hardware Essentials

## Course Outcome Summary

### Course Information

<b>Organization</b>	Madison Area Technical College
<b>Developers</b>	Ronald Koci
<b>Development Date</b>	5/1/2008
<b>Course Number</b>	10-154-189
<b>Instructional Level</b>	Associate Degree
<b>Instructional Area</b>	Computer Information Systems
<b>Division</b>	Business
<b>Department</b>	Information Technology
<b>Potential Hours of Instruction</b>	72
<b>Total Credits</b>	3

### Description

Students Learn basic computer concepts, identify all parts of a PC, discuss the functions and interactions of all PC subsystems, identify and troubleshoot common PC hardware problems and select quality PCs and constituent components based on performance and cost. In addition students learn how to install, replace, and upgrade PC hardware components and install, troubleshoot peripherals, how hardware and operating systems interact and develop techniques of support professional.

### Types of Instruction

<b>Instruction Type</b>	<b>Contact Hours</b>	<b>Credits</b>
Classroom Presentation	36	1
On Campus Lab	36	2

### Textbooks

David Groth. *PC Hardware Essentials*. Wiley. 2007. **Edition:** 1st. **Pages:** 1104. **ISBN:** 978-0-470-07400-8.  
CISCO. *CISCO IT Essentials v4.0 online curriculum*.

### Learner Supplies

3 ring binder.

### Exit Learning Outcomes

#### Core Abilities

- Communication
- Critical thinking
- Science and Technology

#### Program Outcomes

- Develop an understanding of how computers function.
- Troubleshoot basic computer workstations.
- Develop basic methods of troubleshooting
- Solve problems individually and in a team environment

## Competencies

### A. Summarize the IT industry certifications and communication skills required by technicians.

#### You will demonstrate your competence:

1. by completing the assigned lab exercise(s)
2. by participating in the class session
3. by attaining a 70% or better on unit test
4. by completing out of class assignments

#### Your performance will be successful when:

1. you identify IT industry certifications
2. you describe the A+ Certification
3. you explain the relationship between communication and troubleshooting
4. you describe good communication skills and professional behavior
5. you explain ethics and legal aspects of working with computer technology
6. you describe level-one and level-two technician responsibilities
7. you describe proper professional behavior with a customer
8. you can describe the call center environment

#### Learning Objectives

1. Summarize hardware necessary for a computer to work
2. Summarize software necessary for a computer to work
3. Explain the many different hardware components inside and connected to a computer

### B. Summarize the safe lab procedures and the basics of preventative maintenance.

#### You will demonstrate your competence:

1. by completing lab exercise(s)
2. by participating in the class discussion
3. by attaining a 70% or better on unit test
4. by completing out of class assignments

#### Your performance will be successful when:

1. you explain the purpose of safe working conditions and procedures
2. you identify safety procedures and potential hazards for users and technicians
3. you can identify safety procedures to protect the environment from contamination
4. you can identify hardware tools and their purpose
5. you can identify organizational tools and their purpose
6. you can demonstrate the proper tool use
7. you can explain the purpose of preventive maintenance
8. you can identify the steps of the troubleshooting process
9. you can describe the process of gathering data from the customer and computer
10. you can evaluate a problem and implement the solution

#### Learning Objectives

1. Explain how an operating system manages hardware
2. Summarize how system resources help hardware and software communicate
3. Summarize the steps involved in booting your computer

### C. Identify the main components of a PC.

#### You will demonstrate your competence:

1. by completing lab exercise(s)
2. by attaining a 70% or better on unit test
3. by participating in class discussion

4. by completing out of class assignments

**Your performance will be successful when:**

1. you can identify the main components of a computer
2. you can convert a binary number to a decimal number
3. you can distinguish between bits and bytes
4. you can differentiate hexadecimal from decimal numbers
5. you can evaluate and select appropriate computer case styles
6. you can create a computer workspace and select appropriate tools
7. you can identify environmental and safety concerns involved in working with computers
8. you can formulate a troubleshooting plan

**Learning Objectives**

1. Explain how electricity is measured
2. Explain how to protect your computer system against damaging changes in electrical power
3. Summarize different form factors and computer cases
4. Explain how to detect and correct power supply problems
5. Summarize Energy Star specifications

**D. Summarize the basic electrical and safety as they apply to the PC.**

**You will demonstrate your competence:**

1. by completing lab exercise(s)
2. by attaining a 70% or better on unit test
3. by participating in class discussion
4. by completing out of class assignments

**Your performance will be successful when:**

1. you are able to evaluate an appropriate power supply for your system and motherboard
2. you are able to install or replace a power supply
3. you are able to troubleshoot power supply problems and determine whether the problem lies with the power supply, its connections to the system, or whether the problem is external
4. you are able to test resistance and voltage using a multimeter
5. you are able to identify the form factor of a power supply
6. you are able to identify the different devices available for protecting power supply from over or under voltage.
7. you are able to calculate the amount of power needed for a system
8. you enter into class discussions about installing a motherboard
9. you offer questions or comments during class about installing a motherboard
10. you attend class regularly
11. you arrive for class on time
12. you listen attentively during class

**Learning Objectives**

1. Differentiate the types of motherboards
2. Summarize components on the motherboard
3. Develop a basic procedure for building a computer
4. Explain how to install a motherboard
5. Summarize how to troubleshoot a motherboard

**E. Install and summarize the various motherboard types, form factors and processor installations.**

**You will demonstrate your competence:**

1. by completing lab exercise(s)
2. by attaining a 70% or better on unit test

3. by participating in class discussion
4. by completing out of class assignments

**Your performance will be successful when:**

1. you are able to choose an appropriate motherboard for an upgrade
2. you are able to identify, remove and install a motherboard
3. you are able to upgrade a computer's BIOS to support a new functions.
4. you enter into class discussions about how to upgrade and troubleshoot memory
5. you are able to interpret BIOS error signals and messages.
6. you are able to identify a failing processor
7. you are able to determine and analyze processor specifications
8. you are able to safely remove and install a processor
9. you are able to install a cooling system for a processor

**Learning Objectives**

1. Examine different kinds of physical memory and how they work
2. Summarize how to upgrade and troubleshoot memory

**F. Explain memory types and installation troubleshooting.**

**You will demonstrate your competence:**

1. by completing lab exercise(s)
2. by attaining a 70% or better on unit test
3. by participating in class discussion
4. by completing out of class assignments

**Your performance will be successful when:**

1. you are able to discuss how memory works in a computer
2. you are able to identify different memory form factors
3. you are able to discuss and compare DRAM technologies
4. you are able to install a DIMM module(s)
5. you are able to determine ram banking in computer
6. you are able to troubleshoot memory problems

**Learning Objectives**

1. Explain how floppy drives work
2. Determine how to exchange and support floppy drives

**G. Analyze Bus types and system resources.**

**You will demonstrate your competence:**

1. by completing lab exercise(s)
2. by attaining a 70% or better on unit test
3. by participating in class discussion
4. by completing out of class assignments

**Your performance will be successful when:**

1. you are able to identify and describe the two main bus structures found in the computer
2. you can discuss bus architectures in terms of their performance and use
3. you can identify the types of system resources and how they are used
4. you can evaluate and compare motherboards in terms of their supported bus structures and expansion slots
5. you can select an expansion card compatible with a motherboard's expansion buses and slots
6. you are able to install an expansion card
7. you are able to troubleshoot expansion card problems

**Learning Objectives**

1. Summarize hard drive technologies

2. Explain how a computer communicates with hard drive firmware
3. Summarize how a hard drive is logically organized to hold data
4. Determine how to install a hard drive
5. Troubleshoot how to solve hard drive installation problems

**H. Summarize the components and characteristics of hard drives and how they work.**

**You will demonstrate your competence:**

1. by completing lab exercise(s)
2. by attaining a 70% or better on unit test
3. by participating in class discussion
4. by completing out of class assignments

**Your performance will be successful when:**

1. you are able to compare hard drives in terms of industry standard ratings
2. you are able to identify recent hard drive standards
3. you are able to distinguish unique installation considerations for different hard drive technologies
4. you are able to choose an appropriate hard drive and interface for an existing computer
5. you are able to install, partition, and format a hard drive
6. you are able to use system utilities to review the status of a hard drive
7. you are able to troubleshoot a faulty hard drive

**Learning Objectives**

1. Determine how to use ports and expansion slots for add-on devices
2. Explain how to install peripheral I/O devices
3. Examine keyboards and how to troubleshoot them
4. Examine different types of pointing devices
5. Summarize how monitors and video cards relate to the system, and how to troubleshoot them

**I. Explain popular removable storage technologies.**

**You will demonstrate your competence:**

1. by completing lab exercise(s)
2. by attaining a 70% or better on unit test
3. by participating in class discussion
4. by completing out of class assignments

**Your performance will be successful when:**

1. you are able to identify different types of optical drives
2. you are able to identify different types of flash memory devices
3. you are able to evaluate removable storage device in terms of its technology, interface, and capacity
4. you are able to choose an appropriate technology and device for removable storage
5. you are able to install a floppy drive
6. you are able to install an optical drive
7. you are able to troubleshoot a failing storage device

**Learning Objectives**

1. Explain multimedia devices such as sound cards, digital cameras, and MP3 players
2. Explain optical storage technologies such as CD and DVD
3. Summarize how certain hardware devices are used for backups and fault tolerance
4. Summarize how to troubleshoot multimedia and mass storage devices

**J. Evaluate and compare current I/O interface technologies.**

**You will demonstrate your competence:**

1. by completing lab exercise(s)
2. by attaining a 70% or better on unit test

3. by participating in class discussion
4. by completing out of class assignments

**Your performance will be successful when:**

1. you are able to identify I/O ports and connectors
2. you are able evaluate and compare current I/O interface technologies
3. you are able to identify different types of I/O devices
4. you are able to discuss and compare technologies used by popular devices
5. you are able to install and configure common I/O devices
6. you are able to troubleshoot problems with I/O devices

**Learning Objectives**

1. Explore how modems work and how to install them
2. Summarize software that modems use to communicate with the OS
3. Summarize guidelines for troubleshooting modems

**K. Explain the purpose and functions of an operating system.**

**You will demonstrate your competence:**

1. by completing lab exercise(s)
2. by attaining a 70% or better on unit test
3. by participating in class discussion
4. by completing out of class assignments

**Your performance will be successful when:**

1. you are able to explain the purpose of an operating system
2. you are able to describe characteristics of modern operating systems
3. you are able to explain operating system concepts
4. you are able to determine minimum hardware requirements and compatibility with the operating system
5. you are able to install the operating system using default settings
6. you are able to identify the boot sequence files and registry files
7. you are able to describe how to manipulate operating system files
8. you are able to compare and contrast a default installation and a custom installation
9. you are able to create, view, and manage disks, directories, and files
10. you are able to identify procedures and utilities used to optimize the performance of operating systems
11. you are able to describe preventive maintenance procedures for operating systems
12. you are able to troubleshoot operating systems

**Learning Objectives**

1. Explain different types of physical network architectures
2. Summarize how networking works with Windows
3. Install a network card and a network protocol using Windows
4. Troubleshoot tools and tips for network connections
5. Summarize how to connect networks to each other

**L. Evaluate and compare different types of portable systems.**

**You will demonstrate your competence:**

1. by completing lab exercise(s)
2. by attaining a 70% or better on unit test
3. by participating in class discussion
4. by completing out of class assignments

**Your performance will be successful when:**

1. you will be to identify and describe laptop components

2. you will be able to evaluate and compare different types of portable systems
3. you will be able to maintain and manage a laptop
4. you will be able to upgrade a laptop's hard drive or memory
5. you will be able to identify some common uses of PDAs and Smartphones
6. you can describe how to configure laptop power settings
7. you can identify common preventive maintenance techniques for laptops and portable devices
8. you can describe wireless communication methods for laptops and portable devices
9. you can describe how to troubleshoot a laptop

#### **Learning Objectives**

1. Support, upgrade, and add peripheral devices to notebooks
2. Summarize technologies relating to personal digital assistants (PDAs)

#### **M. Identify different printers and their key components and functions.**

##### **You will demonstrate your competence:**

1. by completing lab exercise(s)
2. by attaining 70% or better on unit test
3. by participating in class discussion
4. by completing out of class assignments

##### **Your performance will be successful when:**

1. you can identify different printers and their key components
2. you can install and configure a printer
3. you can clean and maintain a printer
4. you can identify the process of printing in laser printers
5. you can share a printer in the operating system
6. you can connect to a network printer
7. you can describe the common types of scanners
8. you can describe how to install and update the device driver
9. you can describe printer to computer interfaces
10. you can identify and apply common preventive maintenance techniques for printers and scanners
11. you can troubleshoot printers

#### **Learning Objectives**

1. Examine how printers work
2. Investigate how to install printers and share them over a local area network
3. Summarize how to troubleshoot printer problems

#### **N. Evaluate and compare types of networks, protocols, network transmission media and hardware.**

##### **You will demonstrate your competence:**

1. by completing lab exercise(s)
2. by attaining 70% or better on unit test
3. by participating in class discussion
4. by completing out of class assignment(s)

##### **Your performance will be successful when:**

1. you can evaluate and compare types of network protocols, topologies, and architectures
2. you can identify different types of transmission media
3. you can configure a computer for a connection to a network or the internet
4. you can evaluate network connectivity devices
5. you can explain the principles of networking
6. you can explain peer-to-peer networks

7. you can explain client/server networks
8. you can describe basic networking concepts and technologies
9. you can explain bandwidth and data transmission
10. you can describe IP addressing
11. you can describe DHCP
12. you can describe the physical components of a network
13. you can identify Ethernet standards
14. you can define VoIP
15. you can define current broadband technologies
16. you can do basic troubleshooting of a network

#### **Learning Objectives**

1. Summarize basics of SCSI technology and components
2. Compare SCSI hard drives to IDE drives
3. Summarize the installation of a SCSI device

#### **O. Evaluate security threats and techniques for security.**

##### **You will demonstrate your competence:**

1. by completing lab exercise(s)
2. by attaining a 70% or better on unit test
3. by participating in class discussion
4. by completing out of class assignment(s)

##### **Your performance will be successful when:**

1. you can explain why security is important
2. you can describe security threats
3. you can define viruses, worms, and trojans
4. you can define adware, spyware, and grayware
5. you can identify security procedures
6. you can explain what is required in a basic local security policy
7. you can describe ways to protect data
8. you can outline security requirements based on customer needs
9. you can describe and compare firewall types
10. you can describe protection against malicious software
11. you can explain data backup procedures, access to backups, and secure physical backup media
12. you can troubleshoot security

#### **Learning Objectives**

1. Determine guidelines to use when purchasing a PC
2. Summarize how to prepare for assembling a PC yourself

#### **P. Disassemble and assemble a computer using best practice procedures.**

##### **You will demonstrate your competence:**

1. by completing lab exercise(s)
2. by attaining a 70% or better on unit test
3. by participating in class discussion
4. by completing out of class assignment(s)

##### **Your performance will be successful when:**

1. you can explain safe lab procedures and tool use
2. you are able to remove all the components from inside a computer case
3. you are able to install all the components into a computer using best practices
4. you enter into class discussions about approaches to troubleshooting problem
5. you are able to have the computer complete the booting process after complete assembly

### **Learning Objectives**

1. Explain your role as a PC technician in troubleshooting and maintenance, and tools available to help you in those roles
2. Summarize approaches to troubleshooting problem
3. Develop a preventive maintenance plan and what to include in it