Computer Hardware & Support Systems

2020-2021
Grades 10-11
Prerequisite(s): Introduction to Information Technology

Course Description

This course is a project/lab based course designed to introduce you to computer hardware and computer systems support or what is known as Technical Support.

Computer Hardware: Support for all types of computers" PC's, Laptops, Chromebooks, IPads, Tablets and all other handheld mobile devices has evolved into one of the largest professional service industries in the world. Because of this growth, there is a demand for skilled technicians to maintain, support, and upgrade these devices.

Computer System Support: Computer systems today are essentially reliable. While computers still do occasionally fail because of a faulty component (part) the majority of the problems in a computer system are due to software issues or are caused by the computer users themselves. The IT Support workplace now demands skilled technicians who can diagnose software or user generated problems and reach a solution quickly and securely

Course Units/Objectives

This course is broken into 4 units:

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UNIT 1 BEHIND THE PC:

Review the computer systems and how it comes all together. We discuss from the very beginning Bits, Bytes, Binary Code, the hardware components and computer types.

UNIT 1 UNDERSTANDINGS:

U1 Building a computer from scratch based on what it will be used for gives the builder a machine specific to their needs and wants; while providing the builder with a working knowledge of computer hardware and support.

U2 Every fully-functioning computer is made of the same basic internal components. Choosing the brand that best fits requires an understanding of computing power, performance, storage and software being used.

U3 The build doesn't end once you've physically assembled the system, there are additional steps and software needed to ensure that the computer runs reliably and at peak performance.

U4 The final piece of any computer setup is determining what tasks the user needs to perform and then loading the necessary application and security software.

Skills	Knowledge
1. Defining and describing a computer system and how it is used 2. Recognizing digital electronic signals and describing how a computer system uses these to function 3. Convert binary and hexadecimal, to digits and characters 4. Convert bytes and hertz to a computer's capacity 5. Visually identifying the major hardware components of a typical computer system 6. Explaining how each computer hardware component interacts with the other components in the system 7. Designing a computer system:based on usage, style and capacity	❖ **vocabulary:** computer system ❖ **Binary Basics:** ➢ Hexadecimal configurations and conversions from Decimal and Alphanumeric ➢ Binary as it relates to storage, processing and communication ❖ **Electronic Circuits:** its role in the interaction between computer hardware components ❖ **internal hardware** computer components: ➢ CPU Power Supply RAM ➢ Storage: Optical drive , Hard drive , Solid state drive ➢ Expansion cards: Video card, Audio card, Network card, Modem ➢ Motherboard/mainboard ➢ System cooling: Case fans , CPU fans, Liquid cooling ❖ **Wired and wireless peripherals** and their purpose: ➢ Input: keyboard, mouse, touchpad, touchscreen, webcam ➢ Output: screen, monitor, speakers ❖ **Design & Classification of Computers**

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	➢ Use, style, capacity ➢ Personal (Home), Mobile, Work (Office), Networking, Mainframes

UNIT 1 - PERFORMANCE TASK:

TIPS TO BUYING A COMPUTER SYSTEM (*How will students demonstrate their understanding (meaning-making and transfer) through a complex performance task?)* Scholars will use the knowledge they have gained over the unit on computer systems to research a specific style of computer. Using information technology tools to do the research, they will then use that information to make a judgement about what are the most important elements a consumer should be looking for when purchasing that style of computer. They will then present their decision making process and their final recommendation through an online-blog. The blog should explain the process they use to reach their conclusion and the accompanying infographic should convey data that the blog compares and contrasts information for two similar computer systems on: cost, capacity, and design (IPSO) for that style of computer.

Goal
Your task is to create a resource for consumers of computer technology that will help them in their decision making process when purchasing that technology. Your goal is to research a type of computer system for the top elements to consider when buying that type of computer system. You will do the research on the technology and combined with your learning, make a judgement about the most important elements a consumer should be looking for when purchasing that style of computer system. As a blog editor, you will explain your decision making process and your final recommendation through an online-blog; a common way to disseminate information in the Information Technology arena.

Role -
You are a Blog editor for PC Worlds online magazine.

Audience - You have to present your blog piece to the team - the team will decide which blog will lead the

Situation - These days computer systems are all around us. They can take the form of a traditional PC or can be a TV, Gaming System, Portables, or Home systems. Buyers often look for a guide that highlights what the most important specs are when choosing a new computer, and how to know what design specs are right for them.

Consumer Smarts is an online magazine targeted for Generation Z that has helpful blogs, articles, and infographics for consumers in a variety of areas. Their most popular section is technology as Gen Z is the tech generation. Infographics from the site have a download ratio of 90%.

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UNIT 2 COMPUTER SYSTEMS SETUP & SUPPORT:

Students will be able to research, purchase, build, repair and/or support a variety of electronic computing devices in a work setting or in their personal life; understanding that to be knowledgeable about basic computer troubleshooting you have to be knowledgeable about computer hardware and software.

UNIT 2 UNDERSTANDINGS

U1 Building a computer from scratch based on what it will be used for gives the builder a machine specific to their needs and wants; while providing the builder with a working knowledge of computer hardware and support.

U2 Every fully-functioning computer is made of the same basic internal components. Choosing the brand that best fits requires an understanding of computing power, performance, storage and software being used.

U3 The build doesn't end once you've physically assembled the system, there are additional steps and software needed to ensure that the computer runs reliably and at peak performance.

U4 The final piece of any computer setup is determining what tasks the user needs to perform and then loading the necessary application and security software.

Skills	Knowledge
1. Researching and identifying the job skills necessary to work as an IT Support Technician 2. Classifying computers by their form and function 3. Identifying the tools and safety procedures that must be followed when constructing a computer 4. Assembling and disassembling a computer a. Set up, install, and configure motherboards, hard disk drives, optical drives, video cards, parallel/serial port devices, USB devices, video and network cards	❖ **IT Support Technician as a career** ❖ **Computer Hardware: Function and Form** ➢ CPU: *Cores, Speed* ➢ RAM: *Data Transfer Speed, Memory Rate* ➢ HDD/SSD: *Storage Capacity, Speed* ➢ Ports/Slots: *HDMI, USB, SD* ➢ Graphics Card: *Integrated vs. dedicated, Speed, Capacity* ➢ Cooling: *Fans, Heatsinks, Liquid* ➢ Power: *Internal and External* ➢ Expansion Cards/Slots: *Wi-Fi, Bluetooth, Sound* ❖ **General Computer Handling Safety Practices**:including electrical safety and ESD practices when handling power supplies and hardware

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5. Installing, configuring, and managing common peripheral devices

6. Accessing the BIOS/UEFI to monitor, change or add hardware,

7. Troubleshooting common problems related to:
    a. internal components such as motherboards, Power, RAM, CPU, and Storage Drives

8. Installing or upgrading an operating system

9. Changing Boot Device location

10. Create user accounts with roles and permissions

11. Installing or upgrading application software to protect and maintain the health of a computer

12. Troubleshooting common computer software problems as they relate to:
    a. Start-up, peripheral, and application software

13. Navigating and using the features of an OS

14. Navigating through the CMD (roots, dir, copying, moving files, ipconfig, systeminfo)

15. Creating a system of folders/subfolders for organizing data on a computer

16. OS Personalization

17. Creating a mirror image backup of hard drive

18. Finding, copying, moving files and folders inside of a computer

- **Product Information Navigation**: user manual and online resources about hardware that are compatible

- **PC Build Tools-Steps:** Basics tools and steps for constructing a computer

- **Add-On I/O peripherals** that can be purchased and installed, to enhance a computer's performance:
    - *Webcams, Speakers, Microphones, External Storage, printers, scanners, OCR's projectors*
- **BIOS Basics:** What the BIOS is and how it relates to the bootup and maintenance of a computer system's hardware

- **Bootup devices:** thumbdrives, external SSD, CD/DVD
- **Common hardware issues**, what the cause is and how to solve them:
    - *Power, Monitor, HDD, Storage, Expansion Cards*
-
- **Boot Sequence** that all computers use from power-up to sign-in:
    - *POST, OS-MBR, Registry*

- **Operating Systems:** Definition and purpose of operating or system software
- **Application Systems:** Definition and purpose of application software that is used to help the OS with:
    - Protection, Storage, Media and Internet Access
- **Peripherals & Systems** How the OS works with peripheral devices:
    - *Queues, Buffers, IRQ's, Drivers, Plug n Play*

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UNIT 2 - PERFORMANCE TASK:

PERFORMANCE ASSESSMENT *How will students demonstrate their understanding (meaning-making and transfer) through a complex performance task?* In this Performance Task scholars will demonstrate their understanding of computer construction, troubleshooting and support. They will be researching then building a desktop computer, loading the operating and application software, setting up the desktop per customer spec, then performing industry standard maintenance: *updating, backing up and protection of that computer.*

Goal: People say all the time that building a computer is easy to do. Despite this, few people actually know how to build one. In this project you will design and build your own computer; understanding that to be knowledgeable about basic computer troubleshooting and repair you have to be knowledgeable about computer hardware and software.

Role - You are just starting as an IT Tech Support in training at Best Buy in their Geek Squad Division

Audience - Your trainer (teacher) and the other intern in training (build partner)

Situation - You just got an entry level job at Best Buy in their Geek Squad. The first and most important part of the training for the job of IT Tech Support Specialist is to build a custom ordered computer based on a specific set of specifications with help and support from your instructor.

Product - A desktop PC with:

- Intel CPU, Graphics Card, Wireless NIC, Optical Drive and HDD;
- Loaded with Windows 10, Avast Antivirus, Open Office; Latest version of Chrome/Explorer
- Desktop setup for easy access to client folders and files; specialty folders created as asked
- System updated and backed up to another drive (set to automatic)
- Peripherals added: Keyboard, Mouse, Web Cam

UNIT 3 INTRODUCTION TO COMPUTER NETWORKING:

Students will recognize that computer networking is constantly transforming as new devices are developed; enabling an ever increasing connection of people, devices, and information. The ability to understand, maintain, upgrade, and troubleshoot networks is the best to avoid hackers, viruses, and connection headaches while protecting their equipment, personal and financial information.

UNIT 3 UNDERSTANDINGS

U1 A computer network is the interconnection of multiple devices or **hosts** connected using software to multiple paths for the purpose of sending/receiving data or media.

U2 Networks are divided up into four fundamental areas which include types, topologies, designs and components; which network type companies choose is based on the needs of each business and geographic distances being covered.

U3 Network security is essential to make sure your home or business network is protected against security threats spread over any network; including the largest network the Internet.

U4 Anyone working in the field of IT needs to understand how to troubleshoot network issues both hardware and software; using DNS , ping and trace-route.

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Skills	Knowledge
1. Demonstrating the installation, configuration, optimization, and upgrades of simple network. 2. 3. Recognizing the difference and uses for switches, routers, and wireless access points in a network. 4. 5. Identifying the IP configuration of a device 6. Using the OS network systems 7. Tracing the path a node on the network takes to get to a location on the network 8. Identifying the tools, diagnostic procedures, and troubleshooting techniques for networking, 9. Explaining status indicators for a network including: speed, connectivity, signal strength, and security 10. Explain the difference between network security and cybersecurity 11. Identify the most common types of network viruses that can infect any type of computer and how to prevent or remove them	❖ **Network Fundamentals**: *communication, sharing resources, sharing software, sharing data* ❖ **Network Foundations:** Four foundations of **<u>any</u>** network: *types, topologies, designs and components.* ➢ Definitions of network types: *PAN, HAN, LAN, MAN WAN* ➢ Network Topology and the common types: *star, bus, ring, mesh, hybrid* ➢ Network Architecture or Network Design the two main designs: *Client/Server, Peer to Peer (P2P)* ❖ **Network Media:** common network cables and connections: ➢ *Fiber Optic, Coaxial, CAT, Phone* ➢ *RJ45 and RJ11, ST/SC/LC, MT-RJ* ❖ **Network Hardware:** Names, purposes, and characteristics of network hardware: ➢ *Network Interface Cards, switches, routers, gateways and wireless access points* ➢ *How to install and configure network cards* ❖ **Network Protocols:** The process for how information is sent over a network including: ➢ *Packet Configuration* ➢ *IP Addresses* ➢ *TCP/IP Protocol* ❖ **IP Addressing** ➢ *What is subnets IPv4- IPv6* ➢ *(Classes A-C)* ➢ *Static VS Dynamic*

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	❖ **Wired vs Wireless Transmission** ➢ *Bandwidth* ➢ *Access Points* ➢ *Signal Strength* ➢ *Security* ❖ **Basic Network Troubleshooting** ➢ status indicators for networks: *speed, connection and activity lights, and wireless signal strength, software icons* ➢ diagnostic procedures, and techniques for fixing network connections. ❖ **Network Security:** The three areas of network security in IT: *Physical, Network and Cyber*

UNIT 3 - PERFORMANCE TASK:

PERFORMANCE ASSESSMENT : PEER TO PEER NETWORK *How will students demonstrate their understanding (meaning-making and transfer) through a complex performance task?* **Ready-Set-Connec**t: In this Performance Task scholars will demonstrate their basic understanding of the process that goes behind designing a planning for a network inside a home or business. Peer-to-peer networking technologies are also used in small business or in sensor networks. Sensor networks are used to monitor indoor climate conditions in server farms, detect levels of dangerous chemicals from battlefields, and so on.

Goal: The experience of setting up a small network teaches a person a lot about basic networking technologies. Beginner level network projects include bringing together different types of equipment and evaluating the configuration settings each one offers and determining how easy or difficult it is to get particular types of network connections up and running. They also help unpack the steps needed in the OS for file sharing between two computers on a network.

Role - You are just starting as an IT Tech Support in training at Best Buy in their Geek Squad Division. Now that you have built a computer per customer specs, you have been asked to get the computer ready to participate in a peer-to-peer; with the goal being the sharing of information between this computer and the computer they use for work.

Audience - Your trainer (teacher) and the other intern in training (build partner)

Situation - You just got an entry level job at Best Buy in their Geek Squad.

Product - In this project, you'll be designing and building a peer-to-peer network for a client that is small in scale. Your networking tasks will include:

1. Familiarizing yourselves with the different protocols and media (equipment) that are currently used to construct peer-to-peer networks.

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2. Determining the parameters of this particular peer-to-peer network: number of members (users), maximum number of active nodes (computers), etc.
3. Designing and implementing protocols for how peer nodes join and leave the network and for routing through the network.
4. Defining a login process and any security mechanisms needed for this network.
5. Designing a mechanism for distributing (sharing) data among the nodes(Computers), collecting this data once it has been processed, and combining the results.

UNIT 4 MOBILE COMPUTING:

Students will explore mobile devices, the support systems and how many computer systems are transferring to them.Students will explore how mobile devices work, and develop skills to repair them.

UNIT 4 - UNDERSTANDINGS

U1 Mobile computing is a new area of computer hardware and systems and is a combination of wireless communication and carry-around or portable computers. The increase in mobile computing is also driving new mobile technologies and career opportunities in IT.

U2 There are three main classes of mobile computers: mobile phones, portable computers and wearable computers. These computers are close to the power of a desktop computer; but require modified hardware and software for portability and connectivity.

U3 Mobile computing devices rely heavily on their ability to connect to networks without the need for wires; networking on mobile devices require an understanding of wireless transmission protocols and a greater focus on network and cyber security

Skills	Knowledge
1. Explaining how and why mobile devices are powerful enough to do many of the same things you can do with a desktop or laptop computer. 2. Determining the mobile device or combination of mobile devices needed by a user based on the tasks users are performing. 3. Choosing the right mobile device based on: power needs, purpose and portability 4. Upgrading/replacing: batteries, memory and wifi connection in a laptop	❖ **Vocabulary - Mobile Devices:** handheld, touchscreen, bluetooth, NFC, GPS, G-4,5, Mobile OS, WiFi, Hotspots ❖ **Types of Mobile Devices** types and function of mobile devices: *mobile phones, laptops, tablets and phablets,e-readers and GPS devices and wearable computers.* ❖ **The hardware components** of mobile devices include: ➢ *Central Processing Unit (CPU), Power (batteries), (RAM), (ROM), wireless access, removable storage such as memory cards, input*

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5. Analyzing the similarities and differences between mobile computing Operating System Software	*components and output components* ❖ **I/O Peripherals for Mobile Devices:** ➢ The various built-in and plug in input devices for laptops and other mobile devices: *microphone, keyboard, trackpad/touch screen, cameras and point of sale* ➢ The various built-in and plug in output devices for laptops and other mobile devices: *speakers, headphones, screens, sensors and docking stations* ❖ **Mobile Device Storage:** types of storage used by mobile devices: *external drives, SD cards, SIM cards, and cloud* ❖ **Mobile Devices & Operating Systems:** three major OS systems for mobile devices: *Android, Apple OS and Windows*

UNIT 4 - PERFORMANCE TASK:

PERFORMANCE ASSESSMENT: HOME NETWORK MOBILE CONTROLLER *How will students demonstrate their understanding (meaning-making and transfer) through a complex performance task?* In this Performance Task you will be creating a custom mobile device similar relying on the skills and knowledge they gained in the desktop build in Unit 2 and their new knowledge on mobile devices

Goal: Nowadays, many people are converting their home into SMART homes, controlling their electronics, appliances, lighting and heating and cooling remotely. The control panel that is most popular with customers is the tablet. Customers like the size of the screen (larger than their cellphones) and weight (lighter than a laptop). Because no two people have the same technologies, appliances, etc. in their homes they struggle with choosing a tablet that is specific to one type of hardware and software (Alexa, Google Home). Custom tablets solve this problem because they can have a variety of software loaded on them to operate a variety of devices, they can also be the gateway to all these devices, keeping them and the entire SMART home network secure.

Role - IT Technician - Best Buy “Geek” Squad

Audience - Your trainer (teacher)

Situation - YYou have successfully completed your PC and Network Training; now you are going to take what you have learned in both to combine them for your third and final training before you are officially a member of the Geek Squad and can start handling tickets on your own.

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Product - In this project, you'll be taking a raspberry pi (small hand-held computer) and building it into a touch screen tablet. The tablet must have an onscreen keyboard and the final product will be a unified, touchscreen smart home solution, powered by the Raspberry Pi.

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