Computer Engineering III:
Computer Repairs, Computer-Control Circuits

Course Information

Grade(s):	10-12
Discipline/Course:	Technology Education
Course Title:	Computer Engineering III: Computer Repairs, Computer-Control Circuits
Prerequisite(s):	Computer Engineering II: Circuits-Designing Circuits with small computers *or* Computer Engineering I: Introduction to Digital electronics with instructor permission
Course Description: *Program of Studies*	Building on the foundations of Computer Engineering I and II, students will delve into the world of IT. This course focuses on the standards aligned to CompTIA A+ (a standard IT certification) expanding on 'how a computer works'. Projects revolve around the use of a computer workstation setup and maintained by individual students. Topics include: computer hardware & software, peripherals, microcomputers, mobile devices, basic networking, and IT Professionalism. The content of this course is aligned with CompTIA A+ standards.
Course Essential Questions:	● What different operating systems are used in computers today? ● What are the parts of a computer? ● What is happening during the start-up process of a computing device? ● How have mobile devices impacted computing technologies? ● What is the importance of following the manufactures' instructions when changing settings? ● Why should a technician understand the relationships of application software, operating systems, BIOS, and system hardware components? ● How do the developed skills of a technician impact the successful installation, configuration, and upgrading of computer systems? ● Why are there different disk formats? ● How are input devices used to communicate with a PC system? ● How has the computer video system changed over time? ● How has digital signal transformed both video and audio multimedia experiences? ● What kind of damage can viruses do to a computer system? ● What is the importance of keeping vigilant at defending a system from attack?

	● What is digital citizenship?
Course Enduring Understandings:	● Hardware and peripheral components are the physical things we see and use when working with computers. ● It is important to know how to use passwords correctly and other techniques or systems, in order to properly secure a computer. ● IT support is essential to anyone using a computer and is a worthwhile field of study. ● In order to be a good Digital Citizen one needs to understand how a computer functions and how computers are used, in addition to the roles they may have in a system. ● We can troubleshoot computer problems by identifying Operating systems and thus, identify problems and resources to solve said problems. ● Computers operate as part of varied large and small systems such as WAN, LAN, CAN, PAN, etc.
Duration / Credit(s):	1 year / 1.0 credit(s)
Course Materials/Resources:	CompTIA A+
FPS Course Academic Expectation(s):	SE: Synthesizing and Evaluating UCT: Using Communication Tools
Year at a Glance (Units)	Unit 1 - Digital Citizenship, IT Support, & Professionalism (3-5 weeks) Unit 2 - PC Basics (3-4 weeks) Unit 3 - Software (3-4 weeks) Unit 4 - Hardware (4-6 weeks) Unit 5 - Peripherals (3-5 weeks) Unit 6 - Security (4-6 weeks) Unit 7 - Troubleshooting (3-5 weeks) Unit 8 - Networking (3-5 weeks)

Unit Number and Title:	Unit 1 -Digital Citizenship, IT Support, & Professionalism
Duration:	3-5 weeks
Resource(s):	Computers, lab tools and equipment, various consumables.
Unit Overview:	IT support is essential to any school or business, this unit focuses on the interaction between an IT professional and an end user.
Learning Goals	
Standard(s):	<u>Connecticut Technology Education:</u> CADD.04.03 Define and apply computer terminology. AVC.01 Identify, analyze and synthesize historical, social, economic, environmental, and government regulations impact on Communications technology from multiple authoritative sources. AVC.02 Define and utilize communications technology systems domain specific words and phrases. AVC.03 Demonstrate the use of appropriate communication equipment for the delivery of a message. <u>CompTIA A+:</u> (Core 2) 4.1 Compare and contrast best practices associated with types of documentation. 4.2 Given a scenario, implement basic change management best practices. 4.6 Explain the processes for addressing prohibited content/activity, and privacy, licensing, and policy concepts. 4.7 Given a scenario, use proper communication techniques and professionalism
Essential Question(s):	● Why is it important to use professional communication in the IT industry? ● What is the importance of documentation? ● What is the process for making a computer or system wide change? ● How has social media and artificial intelligence (AI) changed the world we live in? ● What ethics need to be considered when using social media or AI?

Enduring Understanding(s):	● IT support is essential for the smooth operation of any school or business ● End users must be able to trust their IT professionals and be willing to provide accurate information about problems. And make system changes. ● AI has made it easier to create and share content. ● AI is being used to moderate and monitor social media content.
Learning Goal(s): *Students will be able to use their learning to:* (Content/ Skills)	**Content:** (Students will know…) ● skills necessary for proper and professional communication in the Computer Repair and Service field. ● manage change protocols appropriately.. ● how to be a good Digital citizen ● social media can be a tool for good but can also be mishandled. ● artificial intelligence can be a tool for good but can also be mishandled. **Skills:** (Students will be able to…) ● simulate being an IT professional and assisting someone with a problem. ● establish change management protocols for a simulated computer network. ● identify and use best practices for documentation. ● create a repair ticket. ● create a frequently asked questions resource. ● develop and apply strategies for being a responsible digital citizen. ● demonstrate proper use of social media and artificial intelligence. ● generate content using data from social media or AI, while ensuring that the information is accurate, appropriate, and relevant. ● understand why and how changes are applied to devices. ● demonstrate proper communication. ● follow best practices for solving a problem.

Unit Number and Title:	Unit 2 - PC Basics
Duration:	3-4 weeks
Resource(s):	Computers, lab tools and equipment, various consumables.
Unit Overview:	Through the setup of a computer workstation, students will gain an understanding of computers, how they work, and what purposes they serve.
Learning Goals	
Standard(s):	Connecticut Technology Education: CADD.04.03 Define and apply computer terminology CompTIA A+: Core 1 3.1 Explain basic cable types, features, and their purposes. 3.2 Identify common connector types. 3.5 Given a scenario, install and configure motherboards, CPUs, and add-on cards. Core 2 4.4 Explain common safety procedures. 4.5 Explain environmental impacts and appropriate controls.
Essential Question(s):	● What is a computer? ● What does the word binary mean relative to the operation and use of computers? ● What is BIOS/UEFI? ● What does "boot" mean regarding computers and how does one boot a computer? ● What is a command line interface? ● What is an operating system? ● What is a graphical user interface?
Enduring	● Computer systems have to be physically connected with peripherals using various cables and

Understanding(s):	connectors, in order for the system to work. ● Operating systems must be installed onto computers and networks, and then the various required software also loaded on for the system to function as planned.
Learning Goal(s): *Students will be able to use their learning to:* (Content/ Skills)	**Content:** (Students will know…) ● identify the connectors and what they are used for. ● understand the basis of computing and binary. ● demonstrate the use of a command line interface. ● define standardization within the computing industry. **Skills:** (Students will be able to…) ● setup computer workstations and physically connect all hardware. ● describe and demonstrate the power-on/boot sequence of a typical computer. ● load and use the BIOS/UEFI to make system changes. ● install an operating system onto a computer. ● access the BIOS/UEFI.

Unit Number and Title:	Unit 3 - Software
Duration:	3-4 weeks
Resource(s):	Computers, lab tools and equipment, various consumables.
Unit Overview:	An exploration of computer software, the process of installing an operating system in addition to support software.
Learning Goals	
Standard(s):	Connecticut Technology Education: CADD.02.08 Export and import images/files in a variety of file formats. CADD.04.02 Identify and describe the purpose of operating system components. CADD.04.03 Define and apply computer terminology ENG.02.13 Use a variety of productivity software to explain the results of the design process, including spreadsheets, word processing, data analysis, and presentations. AVC.03 Demonstrate the use of appropriate communication equipment for the delivery of a message. CompTIA A+: (Core 1) 3.8 Given a scenario, select and configure appropriate components for a custom PC configuration to meet customer specifications or needs. 3.9 Given a scenario, install and configure common devices. (Core 2) 1.1 Compare and contrast common operating system types and their purpose. 1.2 Compare and contrast features of Microsoft Windows versions. 1.3 Summarize general OS installation considerations and upgrade methods. 1.4 Given a scenario, use appropriate Microsoft command line tools. 1.5 Given a scenario, use Microsoft operating system features and tools. 1.6 Given a scenario, use Microsoft Windows Control Panel utilities. 1.7 Summarize application installation and configuration concepts.

	1.8 Given a scenario, configure Microsoft Windows networking on a client/desktop. 1.9 Given a scenario, use features and tools of the Mac OS and Linux client/desktop operating systems.
Essential Question(s):	● What is an operating system? ● What is Windows? Linux? Mac? ● What is the difference between a GUI and command line operating system?
Enduring Understanding(s):	● Computers use operating systems and software which must be installed on the computer drive before it will function as planned. ● Computer operating systems and software must be managed and configured. ● Computers need command-line interface commands to operate.
Learning Goal(s): *Students will be able to use their learning to:* (Content/ Skills)	**Content:** (Students will know…) ● compare computer operating systems. ● identify and explain the software of a computer system. ● identify and explain the connectors of a computer system. ● explain Mobile OS vs Desktop OS. **Skills:** (Students will be able to…) ● use software to complete a task.

Unit Number and Title:	Unit 4 - Hardware
Duration:	4-6 weeks
Resource(s):	Computers, Lab tools and equipment, various consumables.
Unit Overview:	Explore computer hardware in detail, identify the specific hardware of a system.
Learning Goals	
Standard(s):	Connecticut Technology Education: CADD.04.01 Identify and describe various types of hardware and software. CADD.04.03 Define and apply computer terminology AVC.03 Demonstrate the use of appropriate communication equipment for the delivery of a message. CompTIA A+: (Core 1) 3.1 Explain basic cable types, features, and their purpose 3.2 Identify common connector types. 3.5 Given a scenario, install and configure motherboards, CPUs, and add-on cards. 3.6 Explain the purposes and uses of various peripheral types. 3.7 Summarize power supply types and features 5.4 Given a scenario, troubleshoot video, projector, and display issues. (Core 2) 1.3 Summarize general OS installation considerations and upgrade methods.
Essential Question(s):	● What is BIOS? ● What is form factor? ● What are the connectors for graphics/displays? ● What is RAID?
Enduring	● Hardware must be integrated correctly in order for a computer to function.

Understanding(s):	● Computers utilize common industry connectors to physically connect peripherals or other components. ● Specific hardware needs to be carefully selected when building a computer.
Learning Goal(s): *Students will be able to use their learning to:* (Content/ Skills)	**Content:** (Students will know…) ● computer system hardware. ● computer system connecting devices, cables, etc. **Skills:** (Students will be able to…) ● connect/disconnect all of the parts of a computer. ● setup a working computer system. ● change display & display cables. ● install expansion cards.

Unit Number and Title:	Unit 5 - Peripherals
Duration:	3-5 weeks
Resource(s):	Computers, lab tools and equipment, various consumables.
Unit Overview:	Work with additional peripherals to expand the capability of a computer.
Learning Goals	
Standard(s):	Connecticut Technology Education: CADD.04.03 Define and apply computer terminology AVC.03 Demonstrate the use of appropriate communication equipment for the delivery of a message. CompTIA A+: (Core 1) 1.1 Given a scenario, install components within the display of a laptop 1.4 Compare and contrast characteristics of various types of other mobile devices. 3.6 Explain the purposes and uses of various peripheral types. 3.9 Given a scenario, install and configure common devices. 3.10 Given a scenario, configure SOHO multifunction devices/printers and settings. 3.11 Given a scenario, install and maintain various print technologies. 5.6 Given a scenario, troubleshoot printers. (Core 2) 1.1 Compare and contrast common operating system types and their purposes. 1.3 Summarize general OS installation considerations and upgrade methods. 2.8 Given a scenario, implement methods for securing mobile devices. 3.4 Given a scenario, troubleshoot mobile OS and application issues.
Essential Question(s):	● What are the different types of printers? ● What is the process for configuring a printer? ● What is the difference between mobile and laptop operating systems? ● What is the difference between mobile and laptop devices?

	● How can a mobile device or laptop be reset to factory standards? ● How do mobile devices connect to a network?
Enduring Understanding(s):	● Computers and laptops need to be configured the way we want to use them. ● Mobile devices need to be configured the way we want to use them.
Learning Goal(s): *Students will be able to use their learning to:* (Content/ Skills)	**Content:** (Students will know…) ● there are various types of printers depending on one's needs. ● what computer peripherals are and how to connect them to a personal device or network. ● there are different mobile operating systems. **Skills:** (Students will be able to…) ● install and use printers. ● identify mobile operating systems. ● connect various peripherals to their devices.

Unit Number and Title:	Unit 6 - Security
Duration:	4-6 weeks
Resource(s):	Computers, lab tools and equipment, various consumables
Unit Overview:	Security is a top priority for computer devices; explore the methods of keeping computer hardware physically and digitally safe.
Learning Goals	
Standard(s):	Connecticut Technology Education: CADD.04.03 Define and apply computer terminology CompTIA A+: (Core 1) (Core 2) 2.1 Summarize the importance of physical security measures. 2.2 Explain logical security concepts. 2.3 Compare and contrast wireless security protocols and authentication methods. 2.4 Given a scenario, detect, remove, and prevent malware using appropriate tools and methods. 2.5 Compare and contrast social engineering, threats, and vulnerabilities. 2.7 Given a scenario, implement security best practices to secure a workstation. 2.8 Given a scenario, implement methods for securing mobile devices. 2.9 Given a scenario, implement appropriate data destruction and disposal methods. 2.10 Given a scenario, configure security on SOHO wireless and wired networks. 3.2 Given a scenario, troubleshoot and resolve PC security issues. 4.6 Explain the processes for addressing prohibited content/activity, and privacy, licensing, and policy concepts.
Essential Question(s):	● How can a computer system be protected? Digitally? Physically? ● What is the importance of securing computer devices?

	● What is social engineering? ● What is malware, how can it get onto a device and how can it be removed from a device? ● What is licensing? ● What is (multi-factor) authentication? ● How are digital citizenship and security related?
Enduring Understanding(s):	● Devices need to be protected from outside attacks. ● Data needs to be regularly backed-up in case of outside attacks on your devices. ● Data may be recovered following a malicious attack, but not always. ● Digital citizenship and security are related.
Learning Goal(s): *Students will be able to use their learning to:* (Content/ Skills)	**Content:** (Students will know…) ● that computer security is important. ● the various methods of protecting a computer system. ● the purpose of an Acceptable Use Policy. ● that there are different types of malicious software. **Skills:** (Students will be able to…) ● add security measures to a computer device to protect it. ● review the license agreement of software as it is installed to a computer. ● create computer policies that govern a computer system/network. ● practice measures to prevent social engineering. ● backup data to a cloud server or local server. ● identify and discuss the different aspects of digital citizenship, including online safety, privacy and security, digital literacy, and communication.

Unit Number and Title:	Unit 7 - Troubleshooting
Duration:	3-5 weeks
Resource(s):	Computers, lab tools and equipment, various consumables
Unit Overview:	Computing devices constantly have issues that need to be remediate, this unit focus on the process of solving computer problems.
Learning Goals	
Standard(s):	Connecticut Technology Education: CADD.04.03 Define and apply computer terminology. AVC.02.02 Read, interpret and utilize media communication equipment instruction manuals, troubleshooting guides, and specification requirements. CompTIA A+: (Core 1) 5.1 Given a scenario, use the best practice methodology to resolve problems. 5.2 Given a scenario, troubleshoot problems related to motherboards, RAM, CPUs, and power. 5.3 Given a scenario, troubleshoot hard drives and RAID arrays. 5.4 Given a scenario, troubleshoot video, projector, and display issues. 5.5 Given a scenario, troubleshoot common mobile device issues while adhering to the appropriate procedures. (Core 2) 1.3 Summarize general OS installation considerations and upgrade methods. 1.4 Given a scenario, use appropriate Microsoft command line tools. 1.5 Given a scenario, use Microsoft operating system features and tools. 1.6 Given a scenario, use Microsoft Windows Control Panel utilities. 4.3 Given a scenario, implement basic disaster prevention and recovery methods.
Essential Question(s):	• Why is the process of "turning a device off, then back on again" the first step of troubleshooting?

	● How can data be recovered?
Enduring Understanding(s):	● Recognize common problems:start-up, hardware, mechanical. ● Resolve common problems: start-up, hardware, mechanical. ● Apply the steps of troubleshooting.
Learning Goal(s): *Students will be able to use their learning to:* (Content/ Skills)	**Content:** (Students will know…) ● The PC boot sequence. ● Troubleshooting steps. ● Basic recovery methods **Skills:** (Students will be able to…): ● Use diagnostic tools to discover issues. ● Recover data from a cloud server or local server. ● Run system recovery modes to get back to the operating system. ● Reinstall operating systems

Unit Number and Title:	Unit 8 - Networking
Duration:	3-5 weeks
Resource(s):	Computers, lab tools and equipment, various consumables
Unit Overview:	Review computer networking and understand how computer devices are set up to talk to each other.
Learning Goals	
Standard(s):	Connecticut Technology Education: CADD.02.06 Send and access information through a network. CADD.04.03 Define and apply computer terminology CompTIA A+: (Core 1) 2.2 Compare and contrast common networking hardware devices. 2.3 Given a scenario, install and configure a basic wired/wireless SOHO network. 2.6 Explain common network configuration concepts. 2.7 Compare and contrast Internet connection types, network types, and their features. 3.1 Explain basic cable types, features, and their purposes. 3.2 Identify common connector types. (Core 2) 2.10 Given a scenario, configure security on SOHO wireless and wired networks. 4.1 Compare and contrast best practices associated with types of documentation.
Essential Question(s):	● What is ethernet? ● What is a computer network? ● What is WAN? LAN? ● What hardware is necessary to establish a network? ● What is “sneakernet”? ● What are service models? ● What is a twisted-pair cable?

Enduring Understanding(s):	● Networking allows computer devices to talk with one another. ● Network protocols are the rules devices follow when talking with one another.
Learning Goal(s): *Students will be able to use their learning to:* (Content/ Skills)	**Content:** (Students will know…) ● Networking equipment. ● Network connectors. ● The Cloud. ● Communication protocols. **Skills:** (Students will be able to…): ● Identify and use networking equipment. ● Configure a basic home network. ● Demonstrate cloud computing. ● Make network cables.