Computer Engineering IV:
Networking and Troubleshooting

Second Semester

Course Information

Grade(s):	11-12
Discipline/Course:	Technology Education
Course Title:	Computer Engineering IV: Networking and Troubleshooting, Semester II
Prerequisite(s):	Computer Engineering III: Computer Repairs, Computer-Control Circuits (Full Year) *or* Computer Engineering III: Computer Repairs, Computer-Control Circuits (Semester) with teacher's permission *or* Computer Engineering IV: Networking and Troubleshooting, Semester I
Course Description: *Program of Studies*	The dive into Information Technology (IT) continues as we explore the fundamentals of Networking. This course focuses on the standards aligned to CompTIA Network+ (a standard IT certification) expanding on 'how a computer works'. Projects revolve around the building and maintaining a local area network with several computers and servers. Topics will include: networking & network connectivity, data transmissions & communication, servers & operating systems, cloud computing, network Security, network troubleshooting, designing and installing a network. The content of this course is aligned with CompTIA Network+ standards.
Course Essential Questions:	• What is the advantage to Windows Server? Linux Server? • What is an active directory? • What is RAID? • What is a NAS? • What are the different server types and services? • What is virtualization? • What physical methods of security are necessary to protect a network? Digital? • What is a firewall? • How can a wireless network be protected? • What is cloud computing? • What happens if a network loses power? • How can a network be recovered?

	● On what layer of the OSI model might a problem exist? ● What is the WIFI password? ● What hardware is needed to build a network?
Course Enduring Understandings:	● A server needs a specific operating system for a given purpose. ● An Active Directory structure has domains, trees and forests. ● There are differences and benefits to Windows Server OS vs Linux servers. ● Microsoft peer-to-peer network is different from a Microsoft client/server network. ● A layered approach to security is required to protect networks from different types of attacks. ● A firewall monitors and controls incoming network traffic based on predetermined security rules, thus protecting a network. ● Since wireless networks are inherently less protected than hardwired networks they should use strong authentication protocols. ● Cloud computing is a way to access computing resources over the internet, instead of having to own and maintain your own infrastructure. ● Cloud computing, by eliminating the need to purchase infrastructure cna save money on IT costs. ● Networks are complex systems with different components, and any can fail at any time. ● When troubleshooting a problem it is important to gather as much information as possible. ● Power loss can be caused by a variety of things such as natural causes, power outages and equipment failure. ● Network design is a process, not a product. ● Networks must be scalable and flexible, as well as reliable and secure.
Duration/Credits:	Semester / 0.5 credit
Course Materials/Resources:	CompTIA Network+
FPS Course Academic Expectation(s):	SE: Synthesizing and Evaluating UC: Using Communication Tools

Semester at a Glance (Units)	Unit 1: Servers & Operating Systems (8 weeks) Unit 2: Network Security (4 weeks) Unit 3: Cloud Computing (3 weeks) Unit 4: Network Troubleshooting (3 weeks) Unit 5: Designing and Installing a Network (3 weeks)

Unit Number and Title:	Unit 1: Operating Systems & Servers
Duration:	8 weeks
Resource(s):	Computers, Lab tools and equipment, various consumables
Unit Overview:	Computers, Lab tools and equipment, various consumables
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 Network+: 1.1 OSI Model and TCP/IP 1.2 Storage Area Network 1.5 FTP, SSH, Telnet, NFS 1.7 Datacenter Network Architecture 5.3 Command line tools 5.5 Collisions 5.5 DNS Issues
Essential Question(s):	● What is the advantage to Windows Server? Linux Server? ● What is an active directory? ● What is RAID? ● What is a NAS? ● What are the different server types and services? ● What is virtualization?
Enduring Understanding(s):	● A server needs a specific operating system for a given purpose. ● An Active Directory structure has domains, trees and forests.

	● There are differences and benefits to Windows Server OS vs Linux servers. ● Microsoft peer-to-peer network is different from a Microsoft client/server network.
Learning Goal(s): *Students will be able to use their learning to:* (Content/ Skills)	**Content:** (Students will know…) ● different server operating systems. ● how networking protocols evolved. ● the uses and features of Windows Server. ● describe UNIX/Linux servers operating systems. ● describe macOS Server. **Skills:** (Students will be able to…) ● select operating system for specific uses. ● setup a server to perform a given task on the network. ● build an active directory on Local Area Network. ● create a virtual machine. ● demonstrate the use of a server operating system. ● apply RAID. ● work in a virtualized environment.

Unit Number and Title:	Unit 2: Network Security
Duration:	4 weeks
Resource(s):	Computers, Lab tools and equipment, various consumables
Unit Overview:	Security of a network is a top priority to prevent unwanted attacks.
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 Network+: 1.5 SSL, TSL, SSH 2.1 Firewall 2.4 SSID, WPA, WPA2 3.2 Hardening and Security policies 4.2 Common types of attacks 4.4 Remote access methods 4.5 Physical security 5.3 Protocol Analyzer/Packet Capture
Essential Question(s):	● What physical methods of security are necessary to protect a network? Digital? ● What is a firewall? ● How can a wireless network be protected?
Enduring Understanding(s):	● A layered approach to security is required to protect networks from different types of attacks. ● A firewall monitors and controls incoming network traffic based on predetermined security rules, thus protecting a network.

	● Since wireless networks are inherently less protected than hardwired networks they should use strong authentication protocols.
Learning Goal(s): *Students will be able to use their learning to:* (Content/ Skills)	**Content:** (Students will know…) ● network vulnerabilities or security breaches. ● networks have general security measures. ● there are different authentication protocols. **Skills:** (Students will be able to…) ● use various network security tools. ● create secure data that uses encryption and/or authentication. ● physically secure a network. ● apply security measures to a Local Area Network. ● use a firewall to prevent unwanted data.

Unit Number and Title:	Unit 3: Cloud Computing
Duration:	3 weeks
Resource(s):	Computers, lab tools and equipment, various consumables
Unit Overview:	Much of our data is now in "The Cloud", but what exactly does this mean?
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 Network+: 1.8 Summarize cloud concepts and connectivity options
Essential Question(s):	● What is cloud computing?
Enduring Understanding(s):	● Cloud computing is a way to access computing resources over the internet, instead of having to own and maintain your own infrastructure. ● Cloud computing, by eliminating the need to purchase infrastructure cna save money on IT costs.
Learning Goal(s): *Students will be able to use their learning to:* (Content/ Skills)	**Content:** (Students will know…) ● various cloud deployment models. ● specific cloud implementations. **Skills:** (Students will be able to…) ● use a cloud service to transmit data. ● exemplify cloud computing. ● explore various types of cloud computing

Unit Number and Title:	Unit 4: Network Troubleshooting
Duration:	3 weeks
Resource(s):	Computers, lab tools and equipment, various consumables
Unit Overview:	When something goes wrong how can it be fixed? Troubleshooting is essential to solving any problem.
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 Network+: 3.1 Latency and Jitter 3.3 UPS 5.1 Explain the network troubleshooting methodology.
Essential Question(s):	● What happens if a network loses power? ● How can a network be recovered? ● On what layer of the OSI model might a problem exist? ● What is the WIFI password?
Enduring Understanding(s):	● Networks are complex systems with different components, and any can fail at any time. ● When troubleshooting a problem it is important to gather as much information as possible. ● Power loss can be caused by a variety of things such as natural causes, power outages and equipment failure.
Learning Goal(s): *Students will be able to use*	**Content: (**Students will know…) ● common network issues

their learning to: (Content/ Skills)	● power backup scenarios ● system recovery strategies and methods. ● common wireless connectivity problems. **Skills:** (Students will be able to…) ● demonstrate the troubleshooting process. ● identify which layer of the OSI a problem is related to. ● use tools to identify and resolve a network problem. ● install/use a UPS ● discover problems on a network. ● use the proper tool(s) to resolve an issue.

Unit Number and Title:	Unit 5: Designing and Installing a Network
Duration:	3 weeks
Resource(s):	Computers, lab tools and equipment, various consumables
Unit Overview:	This is the part of a network a typical user does not see. What does it take to create a network?
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 Network+: 1.2 Termination - Demarcation Point, Smart Jack 1.3 Termination Points - 66 Block, 110 Block, Patch Panel 1.7 Backbone
Essential Question(s):	● What hardware is needed to build a network?
Enduring Understanding(s):	● Network design is a process, not a product. ● Networks must be scalable and flexible, as well as reliable and secure.
Learning Goal(s): *Students will be able to use their learning to:* (Content/ Skills)	**Content:** (Students will know…) ● how to identify network specifications ● names of organizations that develop important networking and electrical standards. ● what is IEEE? ANSI? TIA? ● what are the parts of a network classified as? ● what is a "Home Router"? **Skills:** (Students will be able to…)

	● create a list of factors to consider when designing a network ● use network design tools to create a model ● select a naming convention for a network. ● use a structure to manage a network