



Computer Engineering IV: Networking and Troubleshooting

First Semester

Course Information

Grade(s):	11-12
Discipline/Course:	Technology Education
Course Title:	Computer Engineering IV: Networking and Troubleshooting, Semester I
Prerequisite(s):	Computer Engineering III: Computer Repairs, Computer-Control Circuits Computer Engineering III: Computer Repairs, Computer-Control Circuits (Semester) with teacher's permission
Course Description: <i>Program of Studies</i>	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:	<ul style="list-style-type: none"> ● What is a computer network? ● What is "network topology"? ● How do computers communicate with each other? ● How does digital citizenship affect being a network administrator? ● What type of network connections exist? ● What are the advantages/disadvantages to connecting to a network with a wire? Wireless? ● How is data transmitted from one device to another? ● What types of wireless technologies exist? ● What is the process for data to be sent through a network? ● What is ethernet? ● What are protocols? ● What is the difference between IPv4 and IPv6?

	<ul style="list-style-type: none"> • What is a Router? Bridge? Hub? Switch? • Why is a VLAN useful? • What are the fundamentals of voice and audio signals? • What is HTTP? FTP? SMTP? POP? IMAP?
Course Enduring Understandings:	<ul style="list-style-type: none"> • Network topology defines how devices on a network are physically connected to each other. • Network configurations can enhance security and improve network performance. • Computer networks enable access to resources and information. • Computer networks enable entertainment and recreation. • There are various different ways to connect to a network such as Ethernet. • 802.11 WIFI is a standard network connection method. • There are various categories of ethernet cables depending on the project at hand. • Data is transmitted from a sender to a receiver within packets. • An IP address is a unique identifier for a network device. • DNS (Domain Name System) are easy to remember names for online sources such as websites., • DHCP (Dynamic Host Configuration Protocol assigns IP addresses to devices. • A Router must be used to establish a home network. • Web services are used on a regular basis via Universal Resource Locators (URLs).
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: Introduction to Networking (4 weeks) Unit 2: Network Connectivity (8 weeks) Unit 3: Data Transmissions & Communication (8 weeks)

Unit Number and Title:	Unit 1: Introduction to Networking
Duration:	4 weeks
Resource(s):	N/A
Unit Overview:	Discuss the usefulness of a computer network and the basic configurations.
Learning Goals	
Standard(s):	<p><u>Connecticut Technology Education:</u> CADD.02.06 Send and access information through a network. CADD.04.03 Define and apply computer terminology AVC.05 Analyze and apply laws affecting communication enterprises to maintain up-to-date compliance with key regulations influencing the industry.</p> <p><u>CompTIA Network+:</u> 1.1 OSI model layers and encapsulation concepts 1.2 Network topologies 1.4 IPv4 vs IPv6 1.7 Common Protocols 2.1 Network Devices</p>
Essential Question(s):	<ul style="list-style-type: none"> ● What is a computer network? ● What is “network topology”? ● How do computers communicate with each other? ● How does digital citizenship affect being a network administrator?
Enduring Understanding(s):	<ul style="list-style-type: none"> ● Network topology defines how devices on a network are physically connected to each other. ● Network configurations can enhance security and improve network performance.

	<ul style="list-style-type: none"> ● Computer networks enable access to resources and information. ● Computer networks enable entertainment and recreation.
Learning Goal(s): <i>Students will be able to use their learning to:</i> (Content/ Skills)	Content: (Students will know...) <ul style="list-style-type: none"> ● OSI and TCP/IP are different network models. ● devices communicate to one another through a network. ● artificial intelligence plays an important role in networking. Skills: (Students will be able to...) <ul style="list-style-type: none"> ● explain the different network topologies. ● discuss common network protocols. ● identify hardware used to build a computer network. ● consider the impact of digital citizenship on a network administrator.

Unit Number and Title:	Unit 2: Network Connectivity
Duration:	8 weeks
Resource(s):	Computers, Lab tools and equipment, various consumables
Unit Overview:	How are devices connected to a computer and what role does WIFI play in connecting to a network system?
Learning Goals	
Standard(s):	<u>Connecticut Technology Education:</u> CADD.02.06 Send and access information through a network. CADD.04.03 Define and apply computer terminology <u>CompTIA Network+:</u> 1.3 Cable types 2.2 Bandwidth management 2.4 Antenna Types 5.2 Troubleshooting and tools 5.4 Interference
Essential Question(s):	<ul style="list-style-type: none"> ● What type of network connections exist? ● What are the advantages/disadvantages to connecting to a network with a wire? Wireless? ● How is data transmitted from one device to another? ● What types of wireless technologies exist?
Enduring Understanding(s):	<ul style="list-style-type: none"> ● There are various different ways to connect to a network such as Ethernet. ● 802.11 WIFI is a standard network connection method. ● There are various categories of ethernet cables depending on the project at hand.

<p>Learning Goal(s): <i>Students will be able to use their learning to:</i> (Content/ Skills)</p>	<p>Content: (Students will know...)</p> <ul style="list-style-type: none">● the different categories of ethernet cables.● there are differences between copper wire, fiber “wire” and wireless connectors.● the 802 standard (specifically 802.3 & 802.11)● the properties of light● fiber-optic cable characteristics as they relate to transmission of data.● wireless networking advantages and disadvantages. <p>Skills: (Students will be able to...)</p> <ul style="list-style-type: none">● make an RJ-45 Ethernet Cable.● connect devices on a network.● apply 802.3 and 802.11 standards.● set up a wireless network.
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Unit Number and Title:	Unit 3: Data Transmissions & Communication
Duration:	8 weeks
Resource(s):	Computers, Lab tools and equipment, various consumables
Unit Overview:	Data travels in packets which must be encoded and decoded.
Learning Goals	
Standard(s):	<u>Connecticut Technology Education:</u> CADD.02.06 Send and access information through a network. CADD.04.03 Define and apply computer terminology <u>CompTIA Network+:</u> 1.1 OSI Model & TCP/IP 1.2 Satellite, cable, leased line, and DSL 1.4 Configure a subnet and use appropriate IP addressing schemes 1.5 FTP, SFTP, TFTP, HTTP, SMTP, POP, IMAP 1.6 DHCP 1.8 Virtual Private Network 2.1 Bridge, Hub Switch, Router, Cable Modem, DSL Modem 2.1 VoIP 2.2 Routing protocols 2.3 VLAN 3.1 Cyclical Redundancy Checks 5.3 Protocol Analyzer

Essential Question(s):	<ul style="list-style-type: none"> ● What is the process for data to be sent through a network? ● What is ethernet? ● What are protocols? ● What is the difference between IPv4 and IPv6? ● What is a Router? Bridge? Hub? Switch? ● Why is a VLAN useful? ● What are the fundamentals of voice and audio signals? ● What is HTTP? FTP? SMTP? POP? IMAP?
Enduring Understanding(s):	<ul style="list-style-type: none"> ● Data is transmitted from a sender to a receiver within packets. ● An IP address is a unique identifier for a network device. ● DNS (Domain Name System) are easy to remember names for online sources such as websites. ● DHCP (Dynamic Host Configuration Protocol) assigns IP addresses to devices. ● A Router must be used to establish a home network. ● Web services are used on a regular basis via Universal Resource Locators (URLs).
Learning Goal(s): <i>Students will be able to use their learning to:</i> (Content/ Skills)	<p>Content: (Students will know...)</p> <ul style="list-style-type: none"> ● digital signals and digital encoding. ● data encoding, transmission and the OSI model. ● IPv4 addressing. ● what a firewall does. ● understand latency. ● the difference between: “Internet”, “Intranet”, and “Extranet”. ● a major telecommunications system has various parts. ● VPNs and their use. <p>Skills: (Students will be able to...)</p> <ul style="list-style-type: none"> ● use network protocol analyzer to encode/decode transmissions. ● interpret the structure and contents of a UDP frame. ● assign IP addresses to nodes (static or DHCP).

- connect to a public DNS.
- use common ports to allow data onto a network.
- configure a router.
- build a VLAN.
- transmit video and audio signals.
- use common protocols to direct data.
- demonstrate remote access.