Unit 5: Devices and Networks

Content Area: **Business**
Course(s): **Generic Course**
Time Period: **Semester 2**
Length: **4 weeks**
Status: **Published**

Standards

CAEP.9.2.12.C.3	Identify transferable career skills and design alternate career plans.	
CAEP.9.2.12.C.7	Examine the professional, legal, and ethical responsibilities for both employers and employees in the global workplace.	
TECH.8.1.12	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.	
TECH.8.1.12.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.	
TECH.8.1.12.B	Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.	
TECH.8.1.12.C	Communication and Collaboration: Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.	
TECH.8.1.12.D	Digital Citizenship: Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.	
TECH.8.1.12.E	Research and Information Fluency: Students apply digital tools to gather, evaluate, and use information.	
TECH.8.1.12.F	Critical thinking, problem solving, and decision making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.	
TECH.8.2.12	Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.	
TECH.8.2.12.A	The Nature of Technology: Creativity and Innovation: Technology systems impact every aspect of the world in which we live.	
TECH.8.2.12.B	Technology and Society: Knowledge and understanding of human, cultural and society values are fundamental when designing technology systems and products in the global society.	
TECH.8.2.12.C	Design: The design process is a systematic approach to solving problems.	
TECH.8.2.12.D	Abilities for a Technological World: The designed world is the product of a design process that provides the means to convert resources into products and systems.	
TECH.8.2.12.E	Computational Thinking: Programming: Computational thinking builds and enhances problem solving, allowing students to move beyond using knowledge to creating knowledge.	

Enduring Understandings

Computer systems are an integral part of everyday life, both personal and in the workplace.

The Internet connects computer systems all over the world.

Hardware security protects the machine and peripheral hardware from theft and from electronic intrusion and damage.

Software and Hardware (or Systems) are everywhere which increasingly makes it foundational in civilization.

Understanding the components of a system allows you to interact with it, even if you do not understand how each piece works.

The decentralized and dynamic nature of networked systems create the potential for a system to fail or behave incorrectly due a component the designer didn't even know existed.

Systems consist of a combination of hardware and software that together achieve some objective and security requires integration of both.

Essential Questions

Section 5.1: Computer Components

- Does hardware depend on software for computing?
- Without hardware, how does software work?
- How does internal and external hardware interact with software?
- What are the categories of malware?
- Does hardware matter for malware?
- What is the difference between low level and high level programming languages?
- What does a software engineer need to consider when developing software for a specific hardware platform?
- How does domain separation relate to hardware and software?

Section 5.2: Networking Fundamentals

- How is the Internet organized and what role do standards and protocols play in keeping networks secure?
- How does an adversary leverage connected networks to serve their purposes?
- How do network security technologies keep our systems and data secure?

Section 5.3: Protocols, Packets & the Internet

- How are protocols different from standards?
- What is the purpose of DNS?
- What is the value of open-source protocols?
- Are proprietary protocols necessarily more secure?

- What is security by obscurity? Is it effective?
- How do protocols implement minimization?

Knowledge and Skills

After completing this unit, student can:

Section 5.1: Computer Components

- Identify students' prior knowledge of PC components
- Identify the 4 basic functions of computer – Input, Storage, Processing and Output
- Understand how 3 key components process data – Motherboard, CPU, and Memory
- Examine instances of attacks on the key PC components
- Identify the steps taken by the PC upon start-up
- Define the difference between BIOS and UEFI firmware
- Examine firmware vulnerabilities and impact on cybersecurity

Section 5.2: Network Fundamentals

- Define difference between LAN and WAN
- Identify characteristics of copper, fiber optic and wireless media
- Identify characteristics of central connection devices
- Define how naming and identifiers are used in networking
- Explore the Wireshark tool used to capture and analyze network packets
- Define the purpose and structure of an IP address
- Recognize the classes of IP addresses
- Distinguish IPs for different size organizations
- Determine if an IP address is valid
- Define the methods of acquiring an IP address
- Identify how APIPA addressing is used in networks.
- Define the purpose of a subnet mask
- Define the method to apply CIDR subnet notation
- Able to explain the purpose of public IP and private IP addresses
- Recognize the public IP ranges and the private IP ranges

Section 5.2: Protocols, Packets & the Internet

- Understand analog method of message delivery as a single communication
- Devise a delivery method for messages that are broken up into packets
- Establish difference between circuit switching and packet switching
- Define protocols and TCP/IP suite
- Explain how protocols use ports / well-known port numbers
- Compare and contrast TCP and UDP transport protocols
- Examine how TCP uses the 3-way handshake
- Perform network traffic analysis using the Wireshark Tool

- Evaluate understanding of concepts covered in Naming + IP addressing
- Define NAT and how it is used to supplement the lack of IP addresses
- Review the basic CLI commands previously learned for both DOS and Linux
- Apply network utility commands to troubleshoot and configure systems.

Transfer Goals

Students will apply knowledge of cybersecurity concepts to engage in discussions of current events.

Students will practice digital citizenship which is an important part of 21st century culture.

Students will understand that complex mathematical models are used to keep data secure.

Students will be able to use ethical reflection and judgment regarding benefits and harms to make decisions.

Students will be able to think critically to evaluate the trust and credibility of organizations.

Students will know the importance of keeping their data secure and private.

Students will install computer updates as soon as they become available.

Students will develop a security mindset which is the ability to identify what might go wrong.

Students will be able to keep themselves and their data safe.

Resources

Curriculum is based on the [Garden State Cybersecurity Curriculum](#)