



Cybersecurity Course Outline

This 519 hour introductory course to information security and penetration testing is the answer for today's Internet-dependent business environment. This course is designed to fill a critical and demanding need for cyber threat intelligence and defense personnel in both public and private sectors. The program focuses on educating and training the new wave of cyber specialists with the ability to track, analyze and counter digital security threats. This form of security intelligence is a blend of physical reconnaissance and defense with modern information technology techniques. Proactive cyber defense is the direction of the future; the gathering of information about trends and behaviors of adversaries in anticipation of opposing attacks against computers and networks.

Cybersecurity falls into the Information and Communication Technologies (ICT) CTE pathway. Information and Communication Technologies have emphasized the need for employees to be able to understand, manage, and support all rapidly emerging, evolving, and converging computer, software, networking, telecommunications, Internet, programming, and information systems. Essential skills in cybersecurity include understanding systems that support the management and flow of data, the ability to work well and communicate clearly with people, and the ability to manage projects efficiently. Students are also expected to show competencies in higher-order thinking, communications, ethics, global diversity, responsible citizenship and leadership. Students who successfully complete this curriculum will have the understanding of incident response techniques that detect, scope and respond to internal and external security breaches. Students will also be proficient in analyzing network risk, configuring, securing, as well as defending networks and critical network assets.

Course Details

Length of Program and Academic Credits Earned:

Year-long 3 hour course = 519 hours (261/semester)

30 total units (15/ semester):

- 10 UC "g" elective credits (5/semester)
- 20 non-a-g elective credits (10/semester)

Pre-Requisites:

- High School Junior or Senior, or 16 years or older

CTE Classification:

- **Industry Sector:** Information and Communication Technologies
- **Industry Pathway:** Networking and Security
- **CA Basic Education Data System (CBEDS) Code:** 4646

<p>Work-Based Learning:</p> <ul style="list-style-type: none"> Limited opportunities will be provided to selected students based on academic capability and industry partner needs, but this is not currently part of the class curriculum 	<p>Certifications & State Tests:</p> <ul style="list-style-type: none"> SVCTE Certificate of Completion awarded with a “C” or better average for both semesters. Cisco Academy IT Essentials courseware
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Possible Education & Career Pathways For more career information: www.onetonline.org

College & Career Pathways:	Career Opportunities	O*NET Codes
<u>Post-Secondary:</u> Students with a high school diploma and having successfully completed this course have a number of entry-level career opportunities, as well as continuing their education.	<ul style="list-style-type: none"> Computer User Support Specialist Computer Operator 	<ul style="list-style-type: none"> 15-1151.00 43-9011.00
<u>Continuing Education: Including Community College, Training Programs, Certifications, etc:</u> <ul style="list-style-type: none"> AA or AS in Computer Science, Cybersecurity Certifications in Network+, Security+, CEH, CHFIC and Informational Assurance 	<ul style="list-style-type: none"> Computer User Support Specialist Computer Operator Web Administrator 	<ul style="list-style-type: none"> 15-1151.00 43-9011.00 15-1199.03
<u>University Majors & Degrees:</u> <ul style="list-style-type: none"> BA or BS in Computer Science, Cybersecurity 	<ul style="list-style-type: none"> Computer Hardware Engineer Computer Programmer Information Security Analyst Security Management Specialist Computer Network Support Specialist Computer and Information Systems Manager Computer Systems Analyst Network and Computer Systems Administrator Computer Network Architect Database Administrator Computer and Information Research Scientist Software Developers, Systems Software Information Technology Project Manager Web Administrator 	<ul style="list-style-type: none"> 17-2061.00 15-1131.00 15-1122.00 13-1199.02 15-1152.00 11-3021.00 15-1121.00 15-1142.00 15-1143.00 15-1141.00 15-1111.00 15-1133.00 15-1199.09 15-1199.03

<p><u>Post-Baccalaureate Degrees</u></p> <ul style="list-style-type: none"> • Masters or Doctorate in Computer Science, Cybersecurity 	<ul style="list-style-type: none"> • Computer Hardware Engineer 17-2061.00 • Computer Programmer 15-1131.00 • Information Security Analyst 15-1122.00 • Security Management Specialist 13-1199.02 • Computer Network Support Specialist 15-1152.00 • Computer and Information Systems Manager 11-3021.00 • Computer Systems Analysts 15-1121.00 • Network and Computer Systems Administrator 15-1142.00 • Computer Network Architect 15-1143.00 • Database Administrator 15-1141.00 • Computer and Information Research Scientist 15-1111.00 • Software Developers, Systems Software 15-1133.00 • Information Technology Project Manager 15-1199.09 • Web Administrator 15-1199.03
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Unit 1: Career Readiness and Professionalism (on-going)	44 hours
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Students will develop personal and professional skills in the classroom that will transfer to the workplace.

- Time management and organization
- Interpersonal skills
- Work with a variety of technology
- Creative thinking and problem solving
- Job search skills including: resume, job applications and effective interview skills

Standards Alignments:
 CCSS: RSIT 11-12.7; LS 11-12.1, 11-12.2, 11-12.6

Key Assignments	CTE Anchor Standards	CTE Pathway Standards
<p>✓ Key Assignment: Students will participate in mock interviews with industry professionals, peers and instructors to improve their communication, interpersonal and employability skill-set.</p> <p>Assessment: rubric, observation of role playing, peer and self- assessment</p>	2.0, 3.0, 4.0, 7.0, 8.0, 9.0	B 1.0, B 2.0, B 5.0
<p>✓ Key Assignment: Students will prepare a resume and cover letter through workshop, self and peer editing, as well as teacher instructions and demonstration.</p> <p>Assessment: peer and instructor editing, portfolio check, editing checklist, rubric</p>	2.0, 3.0, 4.0, 7.0, 8.0, 9.0	B 1.0, B 2.0, B 5.0

<p>✓ Key Assignment: Students will create, design, and organize a dynamic e-portfolio with active links to student work samples. The portfolio will also include lecture notes and documentation that can be used throughout the course for study.</p> <p>Assessment: portfolio check, student conference, self reflection, journal entry</p>	2.0, 3.0, 4.0, 10.0, 11.0	B 1.0, B 2.0, B 3.0, B 4.0, B 5.0, B 6.0, B 7.0, B 8.0
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Unit 2: Ethics and Technology (on-going)	40 hours
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Students will explore the importance of maintaining high ethical standards when working with data, networks, and hardware

- Maintaining the privacy of data
- Maintaining ethics and intellectual property
- Common copyright and plagiarism violations and infringements (*e.g.*, software, media, etc.)
- Common state, federal, and international laws related to computer use and security
- U.S. Patriot Act and the Computer Security Act
- COPPA - Children’s Online Privacy Protection Act
- HIPAA- Health Insurance Portability and Accountability Act

Standards Alignments:
CCSS: LS 11-12.1, 11-12.2; **RSIT** 11-12.2, 11-12.7; **RLST** 11-12.2, 11-12.4, 11-12.7, 11-12.10; **WS** 11-12.1, 11-12.2, 11-12.4, 11-12.5, 11-12.6, 11-12.7, 11-12.8; **WHSST** 11-12.2, 11-12.5, 11-12.6, 11-12.7, 11-12.8
NGSS: SEP 1, 2, 3, 4, 5, 6, 7, 8

Key Assignments	CTE Anchor Standards	CTE Pathway Standards
<p>✓ Key Assignment: Students will watch videos and submit a written analysis of multiple cyber security ethical situations and topics (example: Edward Snowden - Hero? Criminal? Both?). Written reports will be 200-500 words and will involve peer and instructor feedback.</p> <p>Assessment: rubric, entry/exit ticket, written report, public presentation</p>	1.0, 2.0, 4.0, 5.0, 8.0, 10.0, 11.0	B 1.0, B 6.0, B 8.0
<p>✓ Key Assignment: Students will create and present a cyber-safety campaign that examines a topic related to cyber ethics, safety and security. This will be a slide or poster presentation, posted in class and critiqued by peers.</p> <p>Assessment: rubric, quiz, peer and self-assessment, written report, gallery walk, public presentation, portfolio check</p>	1.0, 2.0, 4.0, 5.0, 8.0, 10.0, 11.0	B 1.0, B 6.0, B 8.0
<p>✓ Key Assignment: Students will analyze a security issue whose ethics are questionable, form an opinion and through a verbal and slide presentation, support their position through an informal debate. Students must respond thoughtfully to diverse perspectives, synthesize comments, claims and evidence made on all sides of the issue, resolve contradictions when</p>	1.0, 2.0, 4.0, 5.0, 8.0, 10.0, 11.0	B 1.0, B 6.0, B 8.0

<p>possible, and determine what additional information or research is required to deepen the investigation. Student teams will present their positions and have the opportunity to defend their positions in a class discussion.</p> <p>Assessment: peer and self-assessment, slide presentation</p>		
<p>✓ Key Assignment: Students will complete research, compile information and using a minimum of 3 sources, produce a project of their choice from a list provided by instructor which may include: key historical and current figures within the computer industry, history of the computer, significant computing trends and inventions, significant companies within the computing industry, and the history of the Internet. Students will demonstrate their knowledge by producing an infographic, research paper or multi-media presentation.</p> <p>Assessment: rubric, oral defense, conferencing, self reflection, peer feedback</p>	1.0, 2.0, 4.0, 5.0, 10.0, 11.0	B 1.0, B 2.0, B 3.0, B 4.0, B 5.0, B 6.0, B 7.0, B 8.0

Unit 3: Current Events in Information Communication Technologies (on-going)	20 hours
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Students will explore Cyber Security in the news. Students will research and produce Cyber Security current events presentations. The purpose of this module is to focus student learning on newsworthy current events, but also on written and oral presentation skills.

Standards Alignments:
CCSS: LS 11-12.1, 11-12.2; **RSIT** 11-12.2, 11-12.7; **RLST** 11-12.2, 11-12.4, 11-12.7, 11-12.10; **WS** 11-12.1, 11-12.2, 11-12.4, 11-12.5, 11-12.6, 11-12.7, 11-12.8; **WHSST** 11-12.2, 11-12.5, 11-12.6, 11-12.7, 11-12.8
NGSS: SEP 1, 2, 3, 4, 5, 6, 7, 8

Key Assignments	CTE Anchor Standards	CTE Pathway Standards
<p>✓ Key Assignment: Students will research and write a 2-3 page essay on how laws and ethics shape policy in regards to computer access and security protocols. They must draw evidence from informational texts and websites to support their research, analysis, and reflection.</p> <p>Assessment: written report, public presentation, portfolio check</p>	1.0, 2.0, 4.0, 5.0, 10.0, 11.0	B 1.0, B 6.0, B 8.0
<p>✓ Key Assignment: Students will research and write a persuasive essay on their choice of topic within a selection provided by instructor which will include topics such as: digital footprint, student use of mobile technology in schools, cyberbullying, Internet safety, security. Students will submit a rough draft to peers to edit, make changes based on peer feedback and produce a final draft incorporating those changes. Students will present their essay to class.</p> <p>Assessment: rubric, oral defense, conferencing, self reflection, peer feedback</p>	2.0, 4.0, 5.0, 8.0, 10.0	B 1.0, B 6.0, B 8.0

Unit 4: Hardware Fundamentals and Computer Systems

20 hours

Students will explore the hardware used in standard PCs, servers and network equipment. Topics will include:

- Names, purposes, and characteristics of key components and system modules common to a PC
- Names and performance characteristics of common ports, associated connectors, cabling and the peripherals that use them.
- Basic procedures for upgrading or replacing common field replaceable modules including CPU, RAM, drives and add-on cards.
- Procedures for installing/replacing a new device including loading and configuring device drivers.
- Procedures for installing and configuring a network router and network switch for local and network access

Standards Alignments:

CCSS: LS 11-12.1, 11-12.2; **RSIT** 11-12.2, 11-12.7; **RLST** 11-12.2, 11-12.4, 11-12.7, 11-12.10; **WS** 11-12.1, 11-12.2, 11-12.4, 11-12.5, 11-12.6, 11-12.7, 11-12.8; **WHSST** 11-12.2, 11-12.5, 11-12.6, 11-12.7, 11-12.8

NGSS: SEP 1, 2, 3, 4, 5, 6, 7, 8

Key Assignments	CTE Anchor Standards	CTE Pathway Standards
<p>✓ Key Assignment: Students will compare, contrast and chart the characteristics of popular CPU architecture and RAM form factor and their relationship to various operating system bit structures. Students will gather relevant information from multiple authoritative print and digital sources while using advanced searches to identify established patterns, and predict emerging technologies. Students will log their findings in their interactive notebook.</p> <p>Assessment: rubric, observation, peer and self-assessment, written ticket report, notebook review</p>	2.0, 4.0, 5.0, 10.0	B 1.0, B 2.0, B 3.0, B 4.0, B 6.0, B 7.0
<p>✓ Key Assignment: Students will create a spreadsheet that will help them recognize and identify the different types of computer hardware and its purpose. This spreadsheet will include: images of the different hardware components and detailed description of their functions.</p> <p>Assessment: quiz, portfolio check</p>	2.0, 4.0, 5.0, 10.0	B 1.0, B 2.0, B 3.0, B 4.0, B 6.0, B 7.0
<p>✓ Key Assignment: Students will troubleshoot a non- booting computer (dead PC) and bring it to a running-state. Students will document findings, actions, and outcomes. Students will apply these skills to create an emergency boot disk that will automate this process.</p> <p>Assessment: test run of computer, observation, self reflection journal entry, troubleshooting documentation</p>	4.0, 5.0, 6.0, 7.0, 10.0	B 1.0, B 2.0, B 3.0, B 4.0, B 6.0, B 7.0, B 8.0

<p>✓ Key Assignment: Students will access a PC issues and diagnose the problem. The student will then remove the issues/viruses without further damaging the system, bringing the computer back to a running state.</p> <p>Assessment: test run of computer, observation, self reflection journal entry, troubleshooting documentation</p>	<p>2.0, 4.0, 5.0, 6.0, 7.0, 8.0, 10.0, 11.0</p>	<p>B 1.0, B 2.0, B 3.0, B 4.0, B 6.0, B 7.0, B 8.0</p>
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Unit 5 : Computer Assembly	30 hours
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Students will build a computer, explain how to verify BIOS and UEFI settings, and how to upgrade components in a computer system to meet requirements.

- Assemble the computer
- Open the case and connect the power supply
- Install the motherboard; install drives
- Install the adapter cards; install cables
- Boot the computer POST, BIOS, UEFI
- BIOS and UEFI configuration
- Upgrade and configure a computer
- Motherboard and related components
- Storage devices
- Peripheral devices

Standards Alignments:
CCSS: SLS 11-12.1,11-12.2; **WS** 11-12.1, 11-12.2, 11-12.4, 11-12.6; **LS** 11-12.6; **RLST** 11-12.4, 11-12.7,11-12.10; **WHSST** 11-12.5, 11-12.6, 11-12.8; **A-CED** 1.1
NGSS: SEP 1, 2, 3, 4, 5, 6,7, 8; **ETS** 1.B, 1.C, 2.A, 2.B, **PS** 4.C; **CC** 2

Key Assignments	CTE Anchor Standards	CTE Pathway Standards
<p>✓ Key Assignment: Using student created charts from the hardware identification unit and checklists provided by teacher, students will disassemble a PC following procedural guidelines and demonstrate their knowledge to instructor by describing the components and their purposes. Students will reassemble the PC also using procedural guidelines in the reverse order. Students will conference with instructor to identify proper placement of all hardware. Students will have the opportunity to observe a peer disassembling and reassembling from start to finish and provide feedback and suggestions.</p> <p>Assessment: PC assembly and disassembly rubric, peer and instructor feedback, oral defense, observation, self reflection, self reflection journal entry</p>	<p>4.0, 5.0, 6.0</p>	<p>B 2.0, B 5.0, B 6.0, B 7.0</p>
<p>✓ Key Assignment: After students have successfully demonstrated their ability to disassemble and assemble a PC, they will create their own procedural manual documenting all steps necessary to complete the task, including visual graphics and written descriptions of the process, in an infographic, procedural checklist or multi-media presentation. Students will</p>	<p>4.0, 5.0, 6.0</p>	<p>B 2.0, B 5.0, B 6.0, B 7.0</p>

exchange the manual they created and attempt to assemble a PC explicitly based on the peer manual. Students will then make adjustments to their manual based on peer feedback. Assessment: observation, instructor feedback, oral defense, peer feedback using the guide		
✓ Key Assignment: Through hand-on labs and team collaboration, students will assemble the components of a PC, re-image a new operating system, and install and update software. Students will write and install software and demonstrate a working PC that is connected properly to a network Assessment: quiz, test, observation, peer and self-assessment, public presentation/demo of working system	2.0, 4.0, 5.0, 10.0	B 1.0, B 2.0, B 3.0, B 4.0, B 7.0, B 8.0
✓ Key Assignment: Students teams of 2-3, will re-image a PC system and install service packs and updates to maintain device drivers and system security. Students will install, configure and share the PC on the student class network. Assessment: test, observation, peer and self-assessment, written report, gallery walk, public presentation/demo of working system	2.0, 4.0, 5.0, 8.0, 9.0, 10.0	B 1.0, B 2.0, B 3.0, B 4.0, B 5.0, B 7.0, B 8.0

Unit 6 : Laptops, Mobile Devices and Printer Assembly 30 hours

Students will explain the purpose and characteristics of laptops, configure laptop power settings and wireless settings, remove and install laptop components, explain the purpose and characteristics of mobile devices, perform common preventive maintenance techniques for laptops and mobile devices, and troubleshoot laptops and mobile devices.

- Laptop components
- Laptop displays
- Laptop configuration
- Wireless configuration
- Expansion slots
- Replacing hardware devices
- Mobile device hardware overview
- Printer types
- Installing and configuring printers
- Configuring options and default settings
- Operating system settings for sharing printers
- Print servers

Standards Alignments:
CCSS: SLS 11-12.1, 11-12.2; **WS** 11-12.1, 11-12.2, 11-12.4, 11-12.6; **LS** 11-12.6; **RLST** 11-12.4, 11-12.7, 11-12.10; **WHSST** 11-12.5, 11-12.6, 11-12.8
NGSS: SEP 1,2, 3, 4, 5, 6, 7, 8; **ETS** 1.B, 1.C ,2.A, 2.B, 4.C

Key Assignments	CTE Anchor Standards	CTE Pathway Standards
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<p>✓ Key Assignment: Using an instructor provided checklist and preventative maintenance kit, students will disassemble a working laserjet printer and provide preventative maintenance, reassemble the printer to factory specifications and test for working order.</p> <p>Assessment: successful print, observation and teacher feedback, checklist, ping test, self reflection journal entry</p>	4.0, 5.0, 6.0	B 2.0, B 5.0, B 6.0, B 7.0
<p>✓ Key Assignment: Using an instructor provided checklist and preventative maintenance kit, students will disassemble a laptop and/or mobile device and provide preventative maintenance, reassemble the device to factory specifications and test for working order.</p> <p>Assessment: successful print, observation and teacher feedback, checklist, ping test, self reflection journal entry</p>	4.0, 5.0, 6.0	B 2.0, B 5.0, B 6.0, B 7.0

Unit 7: Windows Installation, Configuration, Management and Virtual Machines	25 hours
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Students will perform routine system management tasks with common Microsoft Windows tools, configure virtualization on a computer, use common preventive maintenance techniques for Microsoft Windows operating systems, and explain how to troubleshoot Microsoft Windows operating systems.

- Windows GUI and control panel
- Windows desktop, tools and applications
- Control panel utilities
- Administrative tools
- Disk defragmenter and disk error-checking tool
- Command line tools
- Purpose and requirements of virtualization
- Common preventive maintenance techniques for operating systems
- OS preventive maintenance plan
- Basic troubleshooting process for operating systems
- Common problems and solutions for operating systems
- Client-side virtualization

Standards Alignments:
CCSS: SLS 11-12.2; SLS 11-12.1; **WS** 11-12.1, 11-12.2, 11-12.4, 11-12.6; **LS** 11-12.6; **RLST** 11-12.4, 11-12.7, 11-12.10; **WHSST** 11-12.5, 11-12.6, 11-12.8
NGSS: SEP 1, 2, 3, 4, 5, 6, 7, 8; ETS 1.B, 1.C, 2.A, 2.B, PS 4.C, CC 2

Key Assignments	CTE Anchor Standards	CTE Pathway Standards
<p>✓ Key Assignment: Using a boot order checklist, students will accurately install multiple operating systems (Windows/Linux, Windows/Android, etc.) on one hard drive and resolve and troubleshoot the boot order.</p> <p>Assessment: Demonstration for instructor, boot order checklist, self reflection journal entry</p>	4.0, 5.0, 7.0, 10.0	B 1.0, B 3.0
<p>✓ Key Assignment: Using an instructor provided checklist, students will create multiple virtual operating systems using ISOs within a virtual application such as VirtualBox. With each</p>	4.0, 5.0, 7.0, 10.0	B 1.0, B 2.0, B 3.0, B 5.0

<p>application, students will take a virtual image of their OS as a means of backup and attempt a backup restore. Students will submit their screenshots of the completed OS and backups for Instructor inspection.</p> <p>Assessment: observation, captured screenshot of completed installation, student conference with instructor and demonstration, self reflection journal entry</p>		
<p>✓ Key Assignment: After students have successfully demonstrated their ability to create a virtual image of their OS, they will choose one of their OS images and create their own procedural manual documenting all steps necessary to build a virtual image within VirtualBox, including visual graphics, screen captures and written description of the process in an infographic, procedural checklist, YouTube video or multimedia presentation. Students will exchange the manuals they created and attempt to install an OS explicitly based on peer manual. Students will then make adjustments to their manual based on peer feedback.</p> <p>Assessment: observation, instructor feedback, oral defense, peer feedback using using the guide, self reflection journal entry.</p>	4.0, 5.0, 7.0, 10.0	B 1.0, B 2.0, B 3.0, B 5.0

Unit 8: Linux and OS X Operating Systems		35 hours
<p>Students will study the purpose and characteristics of mobile operating systems, learn methods for securing mobile devices, configure network connectivity and email on mobile devices, explain the purpose and characteristics of Linux and OS X operating systems, and learn how to troubleshoot other operating systems.</p>		
<ul style="list-style-type: none"> ● Mobile operating systems ● Android vs. iOS ● Android touch interface ● IOS touch interface ● Windows phone touch interface ● Common mobile device features ● Methods for securing mobile devices ● Passcode locks 	<ul style="list-style-type: none"> ● Cloud-enabled services for mobile devices ● Software security ● Network connectivity and email ● Wireless and cellular data network ● Bluetooth ● Configuring email ● Mobile device synchronization ● Linux and OS X operating systems 	<ul style="list-style-type: none"> ● Linux and OS X tools and features ● Linux and OS X best practices ● Basic CLI ● Basic troubleshooting process for mobile, Linux, and OS X operating systems ● Common problems and solutions for mobile, Linux, and OS X operating systems
<p>Standards Alignments: CCSS: SLS 11-12.1, 11-12.2; WS 11-12.1, 11-12.2,11-12.4, 11-12.6; LS 11-12.6; RLST 11-12.4, 11-12.7, 11-12.10; WHSST 11-12.5, 11-12.6, 11-12.8 NGSS: SEP 1, 2, 3, 4, 5, 6, 7, 8; ETS 1.B, 1.C, 2.A, 2.B, PS 4.C; CC 2</p>		
Key Assignments	CTE Anchor Standards	CTE Pathway Standards

<p>✓ Key Assignment: Students will conduct on-campus surveys, collecting quantitative and qualitative data on preferred operating systems. They will then use this data to create a database to record and identify trends and customer preferences and present findings to class, communicating clearly, effectively, and with reason.</p> <p>Assessment: rubric, oral defense, conferencing</p>	2.0, 4.0, 5.0, 10.0	B 1.0, B 2.0, B 3.0, B 5.0, B 7.0, B 8.0
<p>✓ Key Assignment: Students will gather information and compare and contrast the different OS (Android and iOS) devices and then document the specifications of each device in a spreadsheet. Students will engage in informal debate orally defending their choice/preference.</p> <p>Assessment: rubric, oral defense, conferencing, portfolio check, quiz</p>	4.0, 5.0, 10.0	B 2.0, B 3.0, B 5.0

Unit 9: Introduction to Networks	20 hours
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Students will explain the components and types of computer networks, purpose and characteristics of networking standards, purpose of physical components of a network, and configure network connectivity between PCs.

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| <ul style="list-style-type: none"> ● Principles of networking ● Computer networks ● Types of networks ● Networking standards | <ul style="list-style-type: none"> ● Reference models ● Wired and wireless ethernet standards ● Physical components of a network ● Network devices | <ul style="list-style-type: none"> ● Cables and connectors ● Basic networking concepts and technologies ● Networked equipment addressing ● Transport layer protocols |
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Standards Alignments:

CCSS: SLS 11-12.2; SLS 11-12.1

NGSS: SEP 1, 2, 3, 4, 5, 6, 7, 8; PS 4.C, ETS 1.B, 1.C, 2.0

Key Assignments	CTE Anchor Standards	CTE Pathway Standards
<p>✓ Key Assignment: Students will self assess their previous knowledge by completing the Cisco IT Essentials course "IT Essentials: PC Hardware and Software." Students will complete online proctored quiz and tests.</p> <p>Assessment: quiz, test</p>	4.0, 5.0, 10.0	B 1.0, B 2.0, B 5.0, B 7.0
<p>✓ Key Assignment: Students will create a "Map of Network Topology" that displays connected network devices in various rooms and buildings. Working in teams, students will research and determine which IP address schemes will allow computer-to-computer communication based on provided tables and submit a written report, detailing how "subnet classes" can impact or improve network communication. Students will log their completed work in their interactive notebook.</p>	2.0, 4.0, 5.0, 6.0, 10.0	B 1.0, B 2.0, B 3.0, B 6.0, B 7.0, B 8.0

Assessment: quiz, test, observation, peer and self-assessment, written report		
<p>✓ Key Assignment: Students will take the Cisco Packet Tracer course, which includes a hands on assessment of network traffic analysis. Students will complete labs, turn in on-line course quiz and tests to measure their proficiency.</p> <p>Assessment: On-line quiz and test</p>	2.0, 4.0, 5.0, 8.0 10.0	B 1.0, B 2.0, B 3.0, B 6.0, B 7.0, B 8.0
<p>✓ Key Assignment: Students will explore the Wireshark tool and gain understanding of network protocol and traffic. They will submit lecture notes and complete multiple self directed and instructor led labs. Labs include analyzing web browser/ web server interactions. Students will complete the Cisco packet tracer labs with 75% or better.</p> <p>Assessment: Lab rubric, observation, peer and self- assessment, and instructor graded assignments, On-line quiz and test</p>	2.0, 4.0, 5.0, 7.0 8.0, 9.0, 10.0	B 1.0, B 2.0, B 3.0, B 6.0, B 7.0, B 8.0

Unit 10: Networking and Basic TCP/IP	40 hours
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Students will explain the components and types of computer networks, purpose and characteristics of networking standards, purpose of physical components of a network, and configure network connectivity between PCs.

- Principles of networking
- Computer networks
- Types of networks
- Networking standards
- Reference models
- Wired and wireless ethernet standards
- Physical components of a network
- Network devices
- Cables and connectors
- Basic networking concepts and technologies
- Networked equipment addressing
- Transport layer protocols

Standards Alignments:
CCSS: SLS 11-12.2; SLS 11-12.1
NGSS: SEP 1, 2, 3, 4, 5, 6, 7, 8; PS 4.C, ETS 1.B, 1.C, 2.0

Key Assignments	CTE Anchor Standards	CTE Pathway Standards
<p>✓ Key Assignment: Students will install and configure a TCP/IP network using routers and switches to create a Local Area Network (LAN), applying the suite of network commands to troubleshoot and monitor performance issues. Students will log their completed work and issue resolution in their interactive notebook. Students will also demonstrate competence transferring files from one network host to another and peer check.</p> <p>Assessment: rubric, observation, peer and self- assessment</p>	4.0, 5.0, 10.0	B 4.0, B 5.0, B 6.0, B 7.0
<p>✓ Key Assignment: Students will create router web access and check DHCP client list on a router to identify computers. Students will log their completed work and issue resolution in their interactive notebook.</p>	4.0, 5.0, 8.0, 10.0	B 2.0, B 4.0, B 5.0, B 6.0

Assessment: rubric, peer review, graded written reports, Instructor observation		
<p>✓ Key Assignment: Students will terminate a CAT6 network cable and test by connecting two devices. They will show their cable is correctly configured, buy connecting it to a test harness and run the cable test application.</p> <p>Assessment: build and connect cable and demo it working, observation, peer and self-assessment</p>	2.0, 4.0, 5.0, 6.0, 10.0	B 3.0, B 6.0, B 8.0
<p>✓ Key Assignment: Students will create a preventative maintenance schedule for a corporate network of computers based on multiple system event logs. Students will read actual computer logs and chart identifiable patterns that are a prelude to a larger failure and also try to identify missing maintenance steps and suggest a better strategy in their accompanying advisory report. Students will report out to the class as if they were advising the board of a company.</p> <p>Assessment: rubric, peer review, graded written reports, Instructor observation</p>	2.0, 4.0, 5.0, 9.0, 10.0	B 1.0, B 2.0, B 3.0 B 7.0

Unit 11: Cybersecurity Essentials	35 hours
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Students will explore career pathways in Cybersecurity, how to behave and how to be safe online.

- Industry certification exams
- Options for continuing education and training
- Career roles and related industry certifications including Network+, Security+, CEH, CHFIC
- College pathways for completing related degree programs such as Information Assurance
- Determine how Internet surfing habits and opening unsolicited email can lead to security compromise
- Distinguish why Windows products seem to be more vulnerable than Apple, Unix, Linux, or Android operating systems

Standards Alignments:
CCSS: LS 11-12.1, 11-12.2; **RSIT** 11-12.2, 11-12.7; **RLST** 11-12.2, 11-12.4, 11-12.7, 11-12.10; **WS** 11-12.1, 11-12.2, 11-12.4, 11-12.5, 11-12.6, 11-12.7, 11-12.8; **WHSST** 11-12.2, 11-12.5, 11-12.6, 11-12.7, 11-12.8

Key Assignments	CTE Anchor Standards	CTE Pathway Standards
<p>✓ Key Assignment: Students will produce an individual bi-weekly slide presentation. Students will have an opportunity to present 2-3 times per semester. Each presentation will be evaluated and critiqued by both student peers and the instructor. The following is an example of presentation slides:</p> <ul style="list-style-type: none"> • Who, What, Where, relevant to cybersecurity. Who was attacked, What was lost. How is this related to cyber security? 	1.0, 2.0, 5.0, 10.0, 11.0	B 1.0, B 6.0, B 8.0

<ul style="list-style-type: none"> • Details of the specific cyber security failure? What problem or failure does the link/article show? How would hackers / malware take advantage? What is the potential damage / danger? • What is the solution? How could this breach or failure be rectified? <p>Assessment: rubric, observation, peer and self- assessment, public critiqued oral presentation</p>		
<p>✓ Key Assignment: Students will take the Cisco “Introduction to Cybersecurity” and “Cybersecurity Essentials” online class and complete the quizzes with a 80% or better</p> <p>Assessment: online quiz with 80% or better (can retake until proficient)</p>	4.0, 5.0, 10.0	B 1.0, B 2.0, B 3.0, B 4.0
<p>✓ Key Assignment: Students will create and present a cyber-safety campaign that examines a topic related to cyber ethics, safety and security and present to class and instructor for discussion and feedback. .</p> <p>Assessment: entry/exit ticket, written report, public presentation</p>	2.0, 4.0, 10.0	B 3.0, B 7.0
<p>✓ Key Assignment: Students will create a multi-boot system of Windows and Linux operating systems, manage user and group accounts to implement best security practices, use drive imaging to backup and recover computer systems on the network and implement Windows nnn Advanced Boot Options Menu (F10) to recover a damaged system. Students will log their completed work and issue resolution in their interactive notebook.</p> <p>Assessment: observation, self-assessment, written report, public presentation</p>	4.0, 5.0, 8.0, 10.0	B 2.0, B 3.0, B 4.0, B 6.0
<p>✓ Key Assignment: Following lectures and presentations, students will participate in labs utilizing Linux command line interface (CLI) commands. Students will submit quiz, tests and example code for review</p> <p>Assessment: quiz, test, observation, peer and self- assessment</p>	2.0, 5.0, 10.0	B 1.0, B 2.0, B 6.0, B 8.0

Unit 12: CyberPatriot and Virtual Machine Management

45 hours

CyberPatriot is a program and competition sponsored by the United States Air Force. Students will engage with the CyberPatriot curriculum and learn the tips and tricks to properly secure an operating system on a local Host PC or server running on a virtual machine.

- CyberPatriots lectures
- “Flaws” and vulnerabilities
- Team competition to solve Operating System VM images provided by the CyberPatriots organization
- VM Operating System images, including Windows and Linux virtual machines

Standards Alignments:

CCSS: SLS 11-12.2; SLS 11-12.1; WS 11-12.1, 11-12.2, 11-12.4, 11-12.6; LS 11-12.6; RLST 11-12.4, 11-12.7, 11-12.10; WHSST 11-12.5, 11-12.6, 11-12.8
NGSS: SEP 1, 2, 3, 4, 5, 6, 7, 8; ETS 1.B, 1.C, 2.A, 2.B, PS 4.C

Key Assignments	CTE Anchor Standards	CTE Pathway Standards
<p>✓ Key Assignment: Students will participate in a series of lectures, worksheets and labs as part of the CyberPatriot program. Students will log their completed work, team interaction, and issue resolution in their interactive notebook.</p> <p>Assessment: Turn in Instructor evaluated assignments and lecture notes</p>	2.0, 4.0, 5.0, 10.0	B 1.0, B 3.0, B 5.0, B 7.0
<p>✓ Key Assignment: Students, in a team-based competition, will investigate, analyze and solve “flaws” vulnerabilities placed in the release CyberPatriot practice images. Their goal is to find and fix all the “flaws” in the OS image. Students will present their list of flaws and resolution to peers for feedback.</p> <p>Assessment: Team based competition, peer based evaluation, self assessment</p>	2.0, 4.0, 5.0	B 1.0, B 3.0, B 5.0, B 7.0
<p>✓ Key Assignment: Students, teams of 2-3, will create their own practice images, that will be traded between teams to encourage a fun class competition. Each team will produce an OS image that can be run as a virtual machine, including a key to the “flaws” and vulnerabilities, a tutorial on how to fix them and python script code to integrate the OS to see if the “flaw” or vulnerability has been fixed. These deliverables will be ZIP’ed and turned in for student and teacher evaluation. Each team will also create and present a slide presentation of their project.</p> <p>Assessment: Peer reviewed oral presentations, with the opportunity to solve other teams OS images, with instructor evaluation of completeness and conformance to project rubric</p>	2.0, 4.0, 5.0, 8.0, 10.0	B 1.0, B 2.0, B 3.0, B 5.0

Unit 13: Networking and Security	35 hours
<p>Students will explore identify security threats, configure IT security, manage IT security on an ongoing basis, and explain how to troubleshoot basic security problems.</p> <ul style="list-style-type: none"> ● Security threats ● Types of security threats ● Security procedures ● Windows local security policy ● Securing web access ● Protecting data ● Protection against malicious software ● Security techniques ● Protecting physical equipment ● Common preventive maintenance techniques for security ● Security maintenance ● Basic troubleshooting process for security ● Applying the troubleshooting process to security ● Common problems and solutions for security 	

Standards Alignments:

CCSS: SLS 11-12.1, 11-12.2; **WS** 11-12.1, 11-12.2, 11-12.4, 11-12.6; **LS** 11-12.6; **RLST** 11-12.4, 11-12.7, 11-12.10; **WHSST** 11-12.5, 11-12.6, 11-12.8
NGSS: SEP 1, 2, 3, 4, 5, 6, 7, 8; **ETS** 1.B, 1.C, 2.A, 2.B, B 4.C; **CC** 2

Key Assignments	CTE Anchor Standards	CTE Pathway Standards
<p>✓ Key Assignment: Students teams will demonstrate the proper way to configure a network and setup firewall software. A written report and demo will be included as part of the assessment. Students will log their completed work and issue resolution in their interactive notebook.</p> <p>Assessment: quiz, test, observation, peer and self-assessment, written report, notebook check</p>	4.0, 5.0, 10.0	B 4.0, B 5.0, B 6.0, B 7.0
<p>✓ Key Assignment: In teams of 2, students will install, update, and use various real time antivirus software and virus scanners to prevent and remove malicious software. Students will log their completed work and issue resolution in their interactive notebook</p> <p>Assessment: quiz, test, observation, peer and self-assessment, written report, notebook check</p>	2.0, 4.0, 5.0, 6.0, 10.0	B 3.0, B 6.0, B 8.0
<p>✓ Key Assignment: In teams of 2, students will demonstrate intrusion detection to identify and resolve potential threats. Students will log their completed work, customer interaction, and issue resolution in their interactive notebook.</p> <p>Assessment: quiz, test, notebook check, observation, peer and self-assessment, written report</p>	2.0, 4.0, 5.0, 6.0, 10.0	B 3.0, B 6.0, B 8.0
<p>✓ Key Assignment: Incorporating a wireless routing network into an existing LAN lab, students will install and configure a wireless router while implementing proper security protocols, such as WEP, WPS2, SSID hiding, and MAC filtering. Students will use a mobile device to verify security are functioning within specified parameters.</p> <p>Assessment: observation, student teacher conference to demonstrate skills, checklist, working network, self reflection journal entry</p>	4.0, 5.0, 8.0, 10.0	B 2.0, B 4.0, B 5.0, B 6.0
<p>✓ Key Assignment: Students will research the top reasons why computer systems are compromised or infected while surfing the Internet. They will compare findings to available browser security settings to identify a best practice procedure, test settings and take screenshots of each confirmed step to create a “How to Secure Your Windows Browser” guide, pamphlet or infographic, including text descriptions that identify which vulnerability is being resolved by each step. Students will then trade their infographic, conduct a peer review, critique and provide feedback. This will be added to student portfolio.</p> <p>Assessment: peer review, observation, instructor feedback, portfolio check, critique, self reflection journal entry</p>	2.0, 4.0, 5.0, 7.0 8.0, 9.0, 10.0	B 1.0, B 2.0, B 3.0 B 5.0, B 6.0, B 7.0

Unit 14: Social Engineering

45 hours

Students will explore how Black Hat Hackers use deception to manipulate individuals into divulging confidential or personal information that may be used for fraudulent purposes. This module will focus specifically on how to protect individuals, companies, and organizations from phishing attacks, and other social engineering exploits

- Social Engineering, including the legal and ethical aspects
- Mock Social Engineering attack
- Defense Against the Dark Arts: How to train and protect corporate interests

Standards Alignments:

CCSS: LS 11-12.1, 11-12.2; **RSIT** 11-12.2, 11-12.7; **RLST** 11-12.2, 11-12.4, 11-12.7, 11-12.10; **WS** 11-12.1, 11-12.2, 11-12.4, 11-12.5, 11-12.6, 11-12.7, 11-12.8; **WHSST** 11-12.2, 11-12.5, 11-12.6, 11-12.7, 11-12.8

NGSS: SEP 1, 2, 3, 4, 5, 6, 7, 8

Key Assignments	CTE Anchor Standards	CTE Pathway Standards
<p>✓ Key Assignment: Students will learn about social engineering past, present and future. Through current events research assignments, students will individually explore social engineering attacks. This is an ongoing project which will be a collection of 4-5 research assignments and will be evaluated by peers as well as the instructor. Feedback will be provided and an opportunity to make changes based on feedback.</p> <p>Assessment: rubric, observation, peer and self- assessment</p>	1.0, 2.0, 5.0, 10.0, 11.0	B 1.0, B 6.0, B 8.0
<p>✓ Key Assignment: Students will be formed into teams to create a social engineering attack scenario. Student teams will create a plan for a social engineering attack, complete a research and reconnaissance scenario and execution plan, simulate the execution of the plan, and produce a results driven report. This project will include a team presentation to the class.</p> <p>Assessment: team project rubric, observation, peer and self- assessment, instructor graded assignments</p>	1.0, 2.0, 5.0, 10.0, 11.0	B 1.0, B 6.0, B 8.0

Unit 15: Penetration Testing, Cyber Defense and Forensics

55 hours

Students will explore the opportunities related to penetration tester, cyber defense and forensics. Students will learn the steps to setup a proper penetration test and interact with industry experts. Students will create an audit of network resources, so a proper cyber defense strategy can be designed to make sure assets are secure and protected from cyber intrusion. Students will learn how to determine if an intrusion has occurred and how to track back to the source of the intrusion. These include:

- Harden system and network defense to reduce risks.
- Audit a Windows system for vulnerabilities.
- Internet surfing habits/unsolicited email can lead to security compromise
- Windows products more vulnerable than Apple, Unix, Linux, or Android operating systems?
- Ethics of using a neighbor’s unsecured Wi-Fi, or scanning networks at a public hotspot or library
- Penetration and Defense
- Forensic technologies, digital evidence collection, evidentiary reporting labs
- Network Assurance, Layered Defense
- Surveillance and Reconnaissance
- Outsider Thread Protection

Standards Alignments:

CCSS: LS 11-12.1, 11-12.2; **RSIT** 11-12.2, 11-12.7; **RLST** 11-12.2, 11-12.4, 11-12.7, 11-12.10; **WS** 11-12.1, 11-12.2, 11-12.4, 11-12.5, 11-12.6, 11-12.7, 11-12.8; **WHSST** 11-12.2, 11-12.5, 11-12.6, 11-12.7, 11-12.8

NGSS: SEP 1, 2, 3, 4, 5, 6, 7, 8

Key Assignments	CTE Anchor Standards	CTE Pathway Standards
<p>✓ Key Assignment: Password vulnerability: In 2 teams, students will create a password using the Echo command and trace it to its last memory address using Debug. In advance of a mock cyber-attack, defending students (Blue Team) will configure common system defenses to repel the attack while attacking students (Red Team) will launch a multi-stage attack while maintaining their own defense during the counterattack. Each student team will produce their audit log of the attack for analysis and documentation of potential vulnerabilities.</p> <p>Assessment: log, observation, peer feedback, self-reflection, written documentation</p>	1.0, 2.0, 5.0, 10.0, 11.0	B 1.0, B 6.0, B 8.0
<p>✓ Key Assignment: Students will scan TCP and UDP ports for real-time system intrusion and identify the intruder’s MAC address (<i>e.g.</i>, netstat, arp, NBTstat, and capture) and will log their completed work and issue resolution in their interactive notebook.</p> <p>Assessment: log, observation, peer feedback, self-reflection, written documentation</p>	1.0, 2.0, 5.0, 10.0, 11.0	B 1.0, B 6.0, B 8.0
<p>✓ Key Assignment: Penetration and Defence Labs: Students will participate in multiple labs which will consist of a number of websites which can be attacked and run scripts against them to extract data. Students will log their completed work and issue resolution in their interactive notebook.</p> <p>Assessment: log, observation, peer feedback, self-reflection, written documentation</p>	1.0, 2.0, 5.0, 10.0, 11.0	B 1.0, B 6.0, B 8.0

<p>✓ Key Assignment: Threat Assessment Labs:</p> <ol style="list-style-type: none"> 1. Rogue laptop: Students will track and identify a “rogue” laptop that keeps changing names and IP addresses across multiple domains (<i>e.g.</i>, scanner, arp, nbtstat, etc.). 2. Stolen laptop: Students will identify a “stolen” laptop on the Internet and trace it to its last known latitude and longitude (<i>e.g.</i> ArcExplorer, Google Earth, Tracert, Finger). For both labs, students will log their completed work and issue resolution in their interactive notebook <p>Assessment: log, observation, peer feedback, self-reflection, written documentation</p>	1.0, 2.0, 5.0, 10.0, 11.0	B 1.0, B 6.0, B 8.0
<p>✓ Key Assignment: Students will use workplace scenarios to identify safety issues, including potential security breaches and employee misconduct. They will also determine the rights and responsibilities of the employee and employer in each scenario. Students will log their completed work and issue resolution in their interactive notebook.</p> <p>Assessment: log, observation, peer feedback, self-reflection, written documentation</p>	1.0, 2.0, 5.0, 10.0, 11.0	B 1.0, B 6.0, B 8.0
<p>✓ Key Assignment: Students will create and present a cyber-safety campaign that examines a topic related to cyber threats and security. Students will design and create an infographic including user-friendly information.</p> <p>Assessment: log, observation, peer and public feedback, document edit and peer review.</p>	1.0, 2.0, 5.0, 10.0, 11.0	B 1.0, B 6.0, B 8.0

Instructional Materials	
Textbooks:	Electronic Media/Supplemental Print Materials/Online Resources:
<p>Programming Arduino 2nd edition Simon Monk – McGraw Hill © 2016 ISBN: 978-1-25-964163-3</p> <p>Programming the Raspberry Pi 2nd edition Simon Monk – McGraw Hill © 2016 ISBN: 978-1-25-958740-5</p> <p>Online Resources:</p> <ul style="list-style-type: none"> • Coursera (www.coursera.org/) • Udemy (www.udemy.com/) • Instructables (www.instructables.com/classes/) Class units 	<p>NetLab - Bay Area Consortium of California Community Colleges (BACCC) netlab.bayict.cabrillo.edu/ - Interactive website and cloud-based computing environment</p> <p>Programming C++ Bjarne Stroustrup – Addison-Wesley © 2009 ISBN: 978-0-321-54372-1</p> <p>Automate The Boring Stuff With Python 5th edition Al Sweigart – No Starch Press © 2016 ISBN: 13-978-1-59327-599-0</p>

Standards Assessed in this Course

CTE Anchor Standards:

- 1.0 Academics: Academics standards are aligned to pathways; see below.
- 2.0 Communications: Acquire and use accurately sector terminology and protocols at the career and college readiness level for communicating effectively in oral, written, and multimedia formats.
- 3.0 Career Planning and Management: Integrate multiple sources of career information from diverse formats to make informed career decisions, solve problems, and manage personal career plans.
- 4.0 Technology: Use existing and emerging technology, to investigate, research, and produce products and services, including new information, as required in the sector workplace environment.
- 5.0 Problem Solving and Critical Thinking: Conduct short, as well as more sustained, research to create alternative solutions to answer a question or solve a problem unique to the sector using critical and creative thinking, logical reasoning, analysis, inquiry, and problem-solving techniques.
- 6.0 Health and Safety: Demonstrate health and safety procedures, regulations, and personal health practices and determine the meaning of symbols, key terms, and domain-specific words and phrases as related to the sector workplace environment.
- 7.0 Responsibility and Flexibility: Initiate, and participate in, a range of collaborations demonstrating behaviors that reflect personal and professional responsibility, flexibility, and respect in the sector workplace environment and community settings.
- 8.0 Ethics and Legal Responsibilities: Practice professional, ethical, and legal behavior, responding thoughtfully to diverse perspectives and resolving contradictions when possible, consistent with applicable laws, regulations, and organizational norms.
- 9.0 Leadership and Teamwork: Work with peers to promote divergent and creative perspectives, effective leadership, group dynamics, team and individual decision making, benefits of workforce diversity, and conflict resolution.
- 10.0 Technical Knowledge and Skills: Apply essential technical knowledge and skills common to all pathways in the sector following procedures when carrying out experiments or performing technical tasks.
- 11.0 Demonstration and Application: Demonstrate and apply the knowledge and skills contained in the Information and Communication Technologies anchor standards, pathway standards, and performance indicators in classroom, laboratory, and workplace settings, and through career technical student organizations such as Future Business Leaders of America and SkillsUSA.

Networking Pathway: Information and Communication Tech

- B1.0 Identify and describe the principles of networking and the technologies, models, and protocols used in a network.**
- B1.1 Define the terminology used in the design, assembly, configuration, and implementation of networks.
 - B1.2 List the fundamental elements of the major networking models established by the industry standards of recognized organizations: the Open System Interconnect (OSI) or transmission-control/Internet protocol (TCP/IP) models.
 - B1.3 Identify and explain how data, voice, and video/communications are carried through the most common network media.

- B1.4 List the characteristics, advantages, and disadvantages of the various networking presentation functions, data formatting, data encryption, and data compression.
- B1.5 Explain the characteristics of networking hardware and applications and the methods to deploy them.
- B1.6 Design and document data/communication systems networks.
- B2.0 Identify, describe, and implement network media and physical topologies.**
- B2.1 Use appropriate wiring and wireless standards and plan, install, and maintain media (copper, fiber, and wireless) for a variety of network systems.
- B2.2 Demonstrate standard procedures and practices for safely using tools and working safely around the electrical environment in various networking systems. B2.3 Test and maintain wired and wireless network communications components and systems.
- B3.0 Install, configure, and differentiate between common network devices.**
- B3.1 Identify and describe the functions of various network devices, including network connectivity hardware.
- B3.2 Describe the differences between various network environments: peer-to-peer, client-server, thin client, virtualized, internetworks, intranets, and extranets.
- B3.3 Distinguish between the topologies and protocols of local area networks and those of wide area networks.
- B3.4 Confirm operating parameters, apply test procedures, make necessary adjustments, and assemble the components of a network system or subsystem.
- B3.5 Configure the major addressing and routing protocols used in networking.
- B3.6 Implement a functional wired and wireless network, including the installation and configuration of components, software, and plug-ins.
- B3.7 Evaluate, select, and deploy a variety of network architectures, information and communication technologies, and protocols.
- B4.0 Demonstrate proper network administration and management skills.**
- B4.1 Identify and use network tools to troubleshoot and verify network availability and performance.
- B4.2 Identify common customer policies and procedures, including those for management of incidents.
- B4.3 Identify the implications of major protocols and international standards and their impact on network management.
- B4.4 Apply appropriate technologies to improve network performance for data, voice, and video transmission.
- B4.5 Apply the proper security patches, updates, and procedures necessary to maintain and support a network.
- B4.6 Use common help-desk tools and resources, such as incident tracking, knowledge database, and staffing to administer and manage a network.
- B4.7 Apply known effective methods of disseminating information and instruction to users.
- B4.8 Use project management skills and tools for managing and maintaining various types of networks.
- B4.9 Analyze network system interdependencies and constraints.
- B5.0 Demonstrate how to communicate and interpret information clearly in industry-standard visual and written formats.**
- B5.1 Classify and use various electronic components, symbols, abbreviations, and media common to network topology diagrams.
- B5.2 Interpret, organize, and communicate complex network diagrams by using information collected from detailed drawings.
- B6.0 Use and assess network communication applications and infrastructure.**
- B6.1 Identify and document the appropriate uses of networking services, products, and applications.

- B6.2 Evaluate the features of communications software products in terms of their appropriateness to organizational tasks.
- B6.3 Configure compatible systems across various platforms and types of media.
- B7.0 Analyze a customer’s organizational needs and requirements to identify networking needs.**
- B7.1 Describe the effective management of human, financial, and communications resources from the standpoints of the user and the provider.
- B7.2 Diagram physical and logical layouts of networks that support information and communication technologies.
- B7.3 Evaluate emerging products, services, and business models in relation to the creation, setup, and management of networks that support information and communication technologies.
- B7.4 Evaluate, create, and process voice, video, and data transmissions.
- B8.0 Identify security threats to a network and describe general methods to mitigate those threats.**
- B8.1 Identify and define command network security threats: hackers, crackers, viruses, worms, and Trojan horses.
- B8.2 Describe the importance of classifying appropriate monitoring devices and procedures for quick identification and prevention of security violations.
- B8.3 List the policies and procedures for routine administration, such as user agreement, incident reporting, and recovery for users.
- B8.4 Identify common potential risks and entrance points, including internal and external risks, and the tools used to neutralize them: firewalls; monitoring; and antivirus, spyware, and spam protection.
- B8.5 Identify and apply common techniques for disaster prevention and recovery.

Common Core Standards:

Language Standards – LS – (Standard Area, Grade Level, Standard #)

- LS 11-12.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
- LS 11-12.6 Acquire and accurately use general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Speaking and Listening Standards –SLS – (Standard Area, Grade Level, Standard #)

- SLS 11-12.1 Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
- SLS 11-12.2 Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

Reading Standards for Informational Text – RSIT – (Standard Area, Grade Level, Standard #)

- RSIT 11-12.2 Determine two or more central ideas of a text and analyze their development over the course of the text, including how they interact and build on one another to provide a complex analysis; provide an objective summary of the text.
- RSIT 11-12.7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.

Reading Standards for Literacy in Science and Technical Subjects – RLST – (Standard Area, Grade Level, Standard #)

- RLST 11-12.2. Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
- RLST 11-12.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
- RLST 11-12.7. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
- RLST 11-12.10. By the end of grade 12, read and comprehend science/technical texts in the grades text complexity band independently and proficiently.

Writing Standards – WS – (Standard Area, Grade Level, Standard #)

- WS 11-12.1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
- WS 11-12.2. Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
- WS 11-12.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- WS 11-12.5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
- WS 11-12.6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
- WS 11-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
- WS 11-12.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the on any one source and following a standard format for citation including footnotes and endnotes.

Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects – WHSST

- WHSST 11-12.2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
- WHSST 11-12.5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
- WHSST 11-12.6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

WHSST 11-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

WHSST 11-12.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

Mathematics:

Algebra – A-CED – Creating Equations

A-CED 1. Create equations and inequalities in one variable including ones with absolute value and use them to solve problems in and out of context, including equations arising from linear functions.

A-CED 2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

A-CED 3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.

A-CED 4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in equations. For example, rearrange Ohm's law $V = IR$ to highlight resistance R .

Algebra – A-REI – Reasoning with Equations and Inequalities

A-REI 1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

A-REI 2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. Solve systems of equations

A-REI 3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

A-REI 4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.

A-REI 5. Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.

A-REI 6. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.

Functions – F-IF – Interpreting Functions

F-IF 1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range.

- F-IF 7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
- Graph linear and quadratic functions and show intercepts, maxima, and minima.
 - Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
 - Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
 - (+) Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
 - Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude

Functions – F-TF – Trigonometric Functions

- F-TF 1. Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.
- F-TF 2. Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.
- F-TF 5. Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.
- F-TF 6. Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed.

Geometry – G-CO – Congruence

- G-CO 12. Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.

Next Generation Science Standards:

Scientific and Engineering Practices

- SEP 1 Asking questions (for science) and defining problems (for engineering)
- SEP 2 Developing and using models
- SEP 3 Planning and carrying out investigations
- SEP 4 Analyzing and interpreting data

Disciplinary Core Ideas

- PS 2.A Forces and Motion
- PS 3.A Definitions of Energy
- PS 3.B Conservation of Energy and Energy Transfer
- PS 3.D Energy: Energy in Chemical Processes and Everyday Life

Crosscutting Concepts

- CC 2. Cause and effect: Mechanism and explanation
- CC 3. Scale, proportion, and quantity. In considering phenomena, it is critical to recognize what is relevant at different measures of size, time, and energy and to recognize how changes in scale,

SEP 5	Using mathematics and computational thinking	PS4:	Waves and Their Applications in Technologies for Information Transfer		proportion, or quantity affect a system’s structure or performance.
SEP 6	Constructing explanations (for science) and designing solutions (for engineering)	PS4.A:	Wave Properties	CC 4.	Systems and system models. Defining the system under study—specifying its boundaries and making explicit a model of that system—provides tools for understanding and testing ideas that are applicable throughout science and engineering.
SEP 7	Engaging in argument from evidence	PS 4.C	Information Technologies and Instrumentation		
SEP 8	Obtaining, evaluating, and communicating information	ETS 1.A	Defining and Delimiting Engineering Problems		
		ETS 1.B	Developing Possible Solutions		
		ETS 1.C	Optimizing the Design Solution		
		ETS 2.0	Links Among Engineering, Technology, Science, and Society	CC 5.	Energy and matter: Flows, cycles, and conservation. Tracking fluxes of energy and matter into, out of, and within systems helps one understand the systems’ possibilities and limitations.
		ETS 2.A	Interdependence of Science, Engineering, and Technology		
		ETS 2.B	Influence of Engineering, Technology, and Science on Society and the Natural World		
		ETS 1-1	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.	CC 6.	Structure and function. The way in which an object or living thing is shaped and its substructure determine many of its properties and functions.
		ETS 1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.		