Pilot Course Proposal

Submitted by: Keith Peck   Building: Hazen High School

Proposed Course Title: AP Cyber Security (A/B/C)

Grade Level: 9th – 12th   Department: CTE Information Technology

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Course Description:

AP CK Cyber: Security is a broad introduction to the field of cybersecurity that aligns closely with a standard first year collegiate introductory cybersecurity course. Students learn about common threats and vulnerabilities, and how those combine to create risk. Students study the ways that individuals and organizations manage risk, and how risk can be mitigated through a defense-in-depth strategy. Students explore specific vulnerabilities, attacks, mitigations, and detection measures across a variety of domains including physical spaces, computer networks, devices, and data and applications. Throughout the course students consider the impact of cybersecurity on individuals, organizations, societies, and governments. Students also engage in a through-course project in which they investigate emerging trends in cybersecurity including the rising role of AI, virtualization, hardware & IoT, and how trends like BYOD and WFH are expanding the attack surface.

Course Goals

Computing continues to play an ever-increasing role in today's society. Having an understanding of computing is an essential skill for those in the 21st century; from working in industries more reliant on technology, using computational methods to further scientific understanding, or being an informed citizen in a world with technology all around us.

This course is a Advanced Placement college course in Cyber Security focused on:

Learning Outcomes

Assessing Risk	▪ Cybersecurity Fundamentals ▪ Develop a Threat Model ▪ Conduct a Risk Assessment
Configuring Security Controls	▪ Defense in Depth ▪ Physical, Administrative, and Operational Controls ▪ Technical Controls: Network Security ▪ Technical Controls: Computer Security ▪ Technical Controls: Access Control
Encrypting Data	▪ Technical Controls: File Security ▪ Symmetric Cryptography ▪ Asymmetric Cryptography ▪ Digital Signatures and Public Key Infrastructure (PKI)
Detecting Cyberattacks	▪ Attack Detection ▪ Attack Methodology ▪ Password Attacks ▪ Application Attacks ▪ Network Attacks
Responding to Cyberattacks	▪ Investigation and Analysis ▪ Containment and Eradication ▪ Recovery

Current needs not being met by other courses:

1. Opportunity for students to gain IT college course credit.
2. Credit is granted based on student work or AP Test.

3. Additional advanced placement learning opportunity for students

Upon completion of course students will be able to meet the following Washington State K-12 Learning Standards:

See attached Framework.

What are the assessments that will be used to determine student achievement of the goals of this course?

See attached Framework.

Describe how this course will address:

- **Alignment with Common Core State Standards (CCSS) and/or WA State Essential Academic Learning Requirements (EALRs)**
  - As seen on the attached course framework, this course uses many Math and ELA CCSS. The course also uses some NGSS.
- **Integration of technology**
  - This course is helping students learn how to develop software and hardware using 1:1 devices and computer/networking labs.
- **Infusion of diversity/multicultural perspectives**
  - As a part of all computer science courses students are asked to reflect and identify the social and ethical impacts of technology
  - Students are also given voice and choice in the content and process of the projects.
  - Students are encouraged to infuse their unique identity and culture into creative coding projects.
- **Integration with other subject areas**
  - Cyber Security is about critically thinking about securing various systems help solve problems across all disciplines. Each project will connect to appropriate subject areas like social studies to data privacy, technical writing and documentation, math and cryptography.
- **Provision of appropriate experiences for learners of varying abilities**
  - Differentiation options are built into the lessons so that all students can be successful in every lesson.
  - Universal Design for Learning and problem-based learning used in this class provide students with varying abilities many way to access materials and demonstrate learning.
  - This course offers a great opportunity for students identified as Highly Capable to advance their education while remaining in our high school building(s).
- This course can provide the challenge that many students are looking for, while keeping them in our building.
- **Development of higher-level thinking and processing skills**
  - Students will be able to work mostly within Application, Analysis, Evaluation, and Creation levels of Bloom's Taxonomy, although there are many other skills that will be practiced from other tiers too (like remembering and understanding information). Do to the nature of this course, being an AP course, students will engage in higher levels of thinking on a daily basis.
- **Articulation of scope and sequences across grades K-12. Will this course replace an existing curriculum? If so, which course?**
  - In schools that are trained by AP College Board this class will replace our current general education Cyber Security class

Current Scope and Sequence:

- See attached Scope and Sequence.
- Also please see current UW course documents that will be used at the following link or https://apcentral.collegeboard.org/media/pdf/career-kickstart-instructional-overview.pdf

Statement of impact:

- This course will impact students by allowing them to earn college credit while in high school.
- It will develop students' critical thinking skills through developing security solutions.

- Students will get chance to earn college course credits

Instructional materials and cost (include titles, names of publishers and copyright):

- Most resources are online and free through AP College Board

SIGN-OFF FOR PILOT COURSE RECOMMENDATION

	Signature **Date**
1. Department Head (Secondary) **Accepts ☐ Rejects ☐**	______________________________
2. Principal **Accepts ☐ Rejects ☐**	______________________________
3. District Content Facilitator **Accepts ☐ Rejects ☐**	______________________________
4. Curriculum Director **Accepts ☐ Rejects ☐**	______________________________

Return original to the Director of Curriculum and Instruction. Copies to Principal and Course Originator.

Course: Cyber Security

	Instructional Hours
TRIMESTER 1	
Unit 1 - Actors/Motivations, CIA & Authentication 2.1.1 - Threat Actors 1.2.1 - CIA Triad and AAA 4.6.2 - Multifactor Authentication (MFA) 2.4.14 - Password Attacks 4.6.3 – Passwords	15
Unit 2 - Social Engineering & Access Control 2.2.2 - Principles of Social Engineering 2.2.3 - Phishing and Spam 5.6.1 - Phishing Awareness 2.2.4 - Misinformation and Impersonation 2.2.5 - Watering Hole Attacks and Typosquatting 5.6.2 - Security Awareness	15
Unit 4 - Cryptographic Solutions 1.4.2 – Encryption 1.4.4 - Obfuscation and Steganography 1.4.5 - Hashing, Digital Signatures, and Blockchain 1.4.1 - Public Key Infrastructure 1.4.6 – Certificates 1.4.3 - Cryptographic Tools 2.4.13 - Cryptographic Attack	15
Unit 5 - Vulnerability Analysis & Remediation 4.3.1 - Identifying Vulnerabilities 5.5.2 – Pentesting 4.4.1 - Monitoring Resources 4.4.2 - Monitoring Tools 1.2.4 - Deception and Disruption Technology 4.3.2 - Vulnerability Management	15
Unit 6 - Security Controls 1.1.1 - Security Controls 3.1.2 - Architecture Considerations 3.2.1 - Infrastructure Considerations 2.5.2 - Hardening Techniques 4.5.3 - Endpoint - Firewall, IDS/IPS & Web Filter 3.2.2 - Network Appliances 2.5.1 - Mitigation Techniques 3.2.3 - Secure Communication/Access and Effective Controls	10
TRIMESTER 2	
Unit 3 - Threats & Attack Surfaces 2.4.1 - Malware 2.4.2 - Ransomware 2.4.3 - Trojans, Backdoors, and RATs 2.4.4 - Viruses, Worms, Spyware & Adware 2.4.5 – Keyloggers 2.4.6 - Logic Bombs & Rootkits 2.2.1 - Common Attack Surfaces	60

2.4.8 - DoS and DDoS Attacks 2.4.9 - DNS Attacks 2.4.10 - Wireless, On-Path, and Replay Attacks 4.5.1 - Endpoint - Protocol & Email Security 4.1.2 - Wireless Devices 2.3.1 - Application Vulnerabilities 2.4.11 - Application Attacks Part 1 2.4.12 - Application Attacks Part 2 4.1.4 - Application Security 2.3.2 - OS and Web-based Vulnerabilities 4.5.2 - Endpoint - OS & Monitoring 2.3.3 - Hardware and Virtualization Vulnerabilities 2.3.4 - Supply Chain, Zero-day, and Cryptographic Vulnerabilities 4.1.3 - Mobile Solutions 2.4.7 - Physical Attacks 1.2.3 - Physical Security	
Unit 7 - Data Management 3.3.1 - Data Classification and Types 3.3.2 - Data Sovereignty and Protection 3.4.1 - Resilience and Recovery I 3.4.2 - Resilience and Recovery II	10
TRIMESTER 3	
Unit 8 - Infrastructure & SecOps 3.1.1 - Architecture and Infrastructure Concepts 4.1.1 - Hardening Targets and Secure Baselines 4.6.1 - Access Management 4.7.1 - Scripting and Automation	10
Unit 9 - Incident Response 2.4.15 - Indicators of Malicious Activity 4.8.1 - Incident Response 4.9.1 - Logs	10
Unit 10 - Processes & Governance 1.2.2 - Gap Analysis and Zero Trust 1.3.1 - Business Processes 1.3.2 - Technical Implications of Change Management 1.3.3 - Documentation and Version Control of Change Management 4.2.1 - Data Asset Management 5.1.1 - Security Governance	10
Unit 11 - Risk, Audits & Compliance 5.2.1 - Risk Management 5.3.1 - Third-Party Vendors 5.4.1 - Security Compliance 5.5.1 - Audits and Attestation	5
Unit 12 – Cyber Careers Career Exploration Certification Review Connect with Professional Mentor Apply to internship / Apprenticeship	25
Total Course Hours	210

Renton School District		
Course: Cyber Security		**Total Framework Hours: 140**
CIP Code: 110901	☐Exploratory ☒Preparatory	**Date Last Modified: 04/09/2020**
Career Cluster: Information Technology		**Cluster Pathway: Network Systems**

COMPONENTS AND ASSESSMENTS
Performance Assessments: Students will work to analyze where global cyber threats originate. The assessment is a two-part assessment. In pairs students will complete the Threat Map Lab to determine if they can explain how the map works. The second part of the assessment is an individual reflection paper discussing the cyber risks to individual, companies, and the economy. The end of unit objectives is also evaluated for mastery by using a quiz.
Leadership Alignment: Students will **work creatively and effectively with others** by **working in pairs to complete** the **Threat Map Lab**. In the lab students will apply the collaborative tools they used in this unit to be **responsible to others** by **getting their work done and using the collaborative tools to communicate progress**. Working in pairs students will demonstrate the ability to **make judgments and decisions, interpret and analyze information** by working together to finish the **CIA Triad assignment.**

Standards and Competencies	
Unit 1: Introduction to Cybersecurity	
Industry Standards and/or Competencies	**Total Learning Hours for Unit: 5**

National Standards for Business Education (www.nbea.org)
Information Technology
XV SECURITY AND RISK MANAGEMENT
Achievement Standard: Design and implement security and risk management policies and procedures for information technology.

Competencies/Objectives

- Explain guidelines for cyber security (legal authority, integrity of evidence, forensics documentation, administrative and technical review, validation testing
- Explain sources of digital evidence
- Understand terminology and industry specific definitions as they relate to the spectrum of digital and multimedia evidence
- Understand admissibility of evidence
- Understand legal issues related to digital forensics
- Understand ethics in practice (particularly privacy) and ethical approach
- Identify what constitutes an ethics issue and explain how it fits with a code of ethics

Aligned Washington State Learning Standards	
Arts	
Computer Science	3A-NI-05 Give examples to illustrate how sensitive data can be affected by malware and other attacks. 3A-NI-06 Recommend security measures to address various scenarios based on factors such as efficiency, feasibility, and ethical impacts. 3A-NI-07 Compare various security measures, considering tradeoffs between the usability and security of a computing system. 3A-NI-08 Explain tradeoffs when selecting and implementing cybersecurity recommendations. 3B-NI-04 Compare ways software developers protect devices and information from unauthorized access. 3B-IC-26 Evaluate the impact of equity, access, and influence on the distribution of computing resources in a global society.
Educational Technology	1.1.a Students articulate and set personal learning goals, develop strategies leveraging technology to achieve them and reflect on the learning process itself to improve learning outcomes. 1.1.b Students build networks and customize their learning environments in ways that support the learning process. 1.1.c Students use technology to seek feedback that informs and improves their practice and to demonstrate their learning in a variety of ways. 1.1.d Students understand the fundamental concepts of technology operations, demonstrate the ability to choose, use and troubleshoot current technologies and are able to transfer their knowledge to explore emerging technologies. 2.2.a Students cultivate and manage their digital identity and reputation and are aware of the permanence of their actions in the digital world. 2.2.b Students engage in positive, safe, legal and ethical behavior when using technology, including social interactions online or when using networked devices. 2.2.c Students demonstrate an understanding of and respect for the rights and obligations of using and sharing intellectual property. 2.2.d Students manage their personal data to maintain digital privacy and security and are aware of data-collection technology used to track their navigation online. 3.3.a Students plan and employ effective research strategies to locate information and other resources for their intellectual or creative pursuits. 3.3.b Students evaluate the accuracy, perspective, credibility and relevance of information, media, data or other resources. 3.3.c Students curate information from digital resources using a variety of tools and methods to create collections of artifacts that demonstrate meaningful connections or conclusions. 3.3.d Students build knowledge by actively exploring real-world issues and problems, developing ideas and theories and pursuing answers and solutions. 5.5.b Students collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making. 6.6.b Students create original works or responsibly repurpose or remix digital resources into new creations. 6.6.c Students communicate complex ideas clearly and effectively by creating or using a variety of digital objects such as visualizations, models or simulations. 6.6.d Students publish or present content that customizes the message and medium for their intended audiences. 7.7.a Students use digital tools to connect with learners from a variety of backgrounds and cultures, engaging with them in ways that broaden mutual understanding and learning.
English Language Arts	W 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. L 11-12.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. L 11-12.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

	L 11-12.4 Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 11–12 reading and content, choosing flexibly from a range of strategies.
Environment & Sustainability	
Financial Education	
Health and Physical Education	
Mathematics	N-Q.1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q.2: Define appropriate quantities for the purpose of descriptive modeling. S-IC.6: Evaluate reports based on data.
Science	
Social Studies	

COMPONENTS AND ASSESSMENTS
Performance Assessments: Students will work in pairs to demonstrate proficiency in using simple algorithms to test the strength of passwords by creating an artifact explaining the pros and cons of using a user algorithm or password generators. Students will work in groups of 2-3 and jigsaw corporate hacking articles. In a group they will answer discussion questions related ethical hacking. Groups will receive feedback from the class and instructor as the articles are discussed in a Socratic seminar. Understanding will be evaluated on a formative basis with daily quizzes that will consist of creating programming samples, expository writing and verbal responses. Students will work individually to complete the Password Hacking lab. This will be a summative assessment of the unit will consist of creating a simple algorithm to create passwords. Students will receive feedback and will be given a chance to improve their grade by doing an enrichment lab. Working in groups of 2-3 students will create a final project to apply the Cybersecurity, Cyber Hygiene, and Digital Citizenship content by creating a Public Service Announcement. Students are checked for proficiency by peers and instructor. The end of unit objectives is also evaluated for mastery by using a quiz.
Leadership Alignment: Students will **work creatively and effectively with others** by **working in pairs to complete** the **Ethical Hacking reflection paper**. Students will demonstrate the ability to **communicate clearly** and **collaborate with others** by completing the reflection paper and participating in the Socratic seminar. Working in pairs students will demonstrate the ability to **make judgments and decisions,** **interpret and analyze information** by working together to **finish the CIA Triad assignment.** Students will demonstrate the ability **collaborate with others**, **access and evaluate information**, and **manage information** through their **Public Service Announcement Project**. During this project students will also demonstrate the ability to **apply technology effectively**, **be flexible**, and **manage goals and time**.

Standards and Competencies	
Unit 2: Digital Citizenship and Cyber Hygiene	
Industry Standards and/or Competencies	**Total Learning Hours for Unit: 25**

National Standards for Business Education (www.nbea.org)

Information Technology

XV SECURITY AND RISK MANAGEMENT

Achievement Standard: Design and implement security and risk management policies and procedures for information technology.

Competencies/Objectives

- Describe the role of the ethical hacker (can and can't do)
- Explain how to create a strong password to protect access
- Explain how a password generator works and the benefits
- Explain guidelines for cyber security (legal authority, integrity of evidence, forensics documentation, administrative and technical review, validation testing
- Explain sources of digital evidence

• Understand terminology and industry specific definitions as they relate to the spectrum of digital and multimedia evidence • Understand admissibility of evidence • Understand legal issues related to digital forensics • Understand ethics in practice (particularly privacy) and ethical approach • What are the requirements of professionals, privacy, and confidentiality • Identify what constitutes an ethics issue and explain how it fits with a code of ethics	
Aligned Washington State Learning Standards	
Arts	
Computer Science	3A-NI-05 Give examples to illustrate how sensitive data can be affected by malware and other attacks. 3A-NI-06 Recommend security measures to address various scenarios based on factors such as efficiency, feasibility, and ethical impacts. 3A-NI-07 Compare various security measures, considering tradeoffs between the usability and security of a computing system. 3A-NI-08 Explain tradeoffs when selecting and implementing cybersecurity recommendations. 3B-NI-04 Compare ways software developers protect devices and information from unauthorized access. 3B-IC-26 Evaluate the impact of equity, access, and influence on the distribution of computing resources in a global society.
Educational Technology	1.1.a Students articulate and set personal learning goals, develop strategies leveraging technology to achieve them and reflect on the learning process itself to improve learning outcomes. 1.1.b Students build networks and customize their learning environments in ways that support the learning process. 1.1.c Students use technology to seek feedback that informs and improves their practice and to demonstrate their learning in a variety of ways. 1.1.d Students understand the fundamental concepts of technology operations, demonstrate the ability to choose, use and troubleshoot current technologies and are able to transfer their knowledge to explore emerging technologies. 2.2.a Students cultivate and manage their digital identity and reputation and are aware of the permanence of their actions in the digital world. 2.2.b Students engage in positive, safe, legal and ethical behavior when using technology, including social interactions online or when using networked devices. 2.2.c Students demonstrate an understanding of and respect for the rights and obligations of using and sharing intellectual property. 2.2.d Students manage their personal data to maintain digital privacy and security and are aware of data-collection technology used to track their navigation online. 3.3.a Students plan and employ effective research strategies to locate information and other resources for their intellectual or creative pursuits. 3.3.b Students evaluate the accuracy, perspective, credibility and relevance of information, media, data or other resources. 3.3.c Students curate information from digital resources using a variety of tools and methods to create collections of artifacts that demonstrate meaningful connections or conclusions. 3.3.d Students build knowledge by actively exploring real-world issues and problems, developing ideas and theories and pursuing answers and solutions. 5.5.b Students collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making. 6.6.b Students create original works or responsibly repurpose or remix digital resources into new creations. 6.6.c Students communicate complex ideas clearly and effectively by creating or using a variety of digital objects such as visualizations, models or simulations. 6.6.d Students publish or present content that customizes the message and medium for their intended audiences. 7.7.a Students use digital tools to connect with learners from a variety of backgrounds and cultures, engaging with them in ways

	that broaden mutual understanding and learning.
English Language Arts	W 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. W 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. W 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. SL 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. SL 11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. L 11-12.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. L 11-12.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. L 11-12.6 Acquire and use accurately 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.
Environment & Sustainability	
Financial Education	
Health and Physical Education	
Mathematics	S-IC.6: Evaluate reports based on data.
Science	
Social Studies	

COMPONENTS AND ASSESSMENTS
Performance Assessments: Students will work individually to complete the Modulo math activity assignment. Students will demonstrate proficiency by scoring 75% or higher on the assignment. Students will work in pairs to demonstrate proficiency in the Caesar Cypher by completing the JavaScript program lab. Students are checked for proficiency by the instructor by demonstrating their decryption computer program. Working in groups of 2-4 students will research cyphers and then work collaboratively to create a Cyber Newscast. Each team creates their newscast and presents it to the class for feedback by peers and instructor. The end of unit objectives is also evaluated for mastery by using a quiz.
Leadership Alignment: Students will demonstrate the ability to **interact effectively with others** in a **diverse team setting** through their **Cyber Newscast project**. The team members will also demonstrate **manage projects** and **produce results**. Students will demonstrate the ability to **reason effectively**, **use systems thinking**, and **solve problems** by completing the **JavaScript decipher computer program**. Students will demonstrate the ability to **think creatively** and **work independently** by through their creating of a **Hashtag computer program**. Students will also demonstrate the ability to be **self-directed learners** through this project.

Standards and Competencies	
Unit 3: Cryptography	
Industry Standards and/or Competencies	**Total Learning Hours for Unit: 30**

National Standards for Business Education (www.nbea.org)

Information Technology

I Impact on Society

Achievement Standard: Assess the impact of information technology in a global society.

Information Technology

II INFORMATION LITERACY

Achievement Standard: Gather, evaluate, use, cite, and disseminate information from technology sources.

Information Technology

III DIGITAL CITIZENSHIP

Achievement Standard: Demonstrate respectful, responsible and ethical behavior in a digital world.

Information Technology

XV SECURITY AND RISK MANAGEMENT

Achievement Standard: Design and implement security and risk management policies and procedures for information technology.

Competencies/Objectives

- Understand the role cryptography plays in protecting data
- Explain the use of hash functions in protecting digital security

• Understand the role modulo math plays in hash programs • Identify what constitutes an ethics issue and explain how it fits with a code of ethics • Knowledge of computer networking concepts and protocols, and network security methodologies. • Knowledge of risk management processes (e.g., methods for assessing and mitigating risk). • Knowledge of laws, regulations, policies, and ethics as they relate to cybersecurity and privacy. • Knowledge of cybersecurity and privacy principles. • Knowledge of cyber threats and vulnerabilities. • Knowledge of specific operational impacts of cybersecurity lapses. • Knowledge of authentication, authorization, and access control methods. • Knowledge of new and emerging information technology (IT) and cybersecurity technologies. • Knowledge that technology that can be exploited. • Knowledge of multiple cognitive domains and tools and methods applicable for learning in each domain. • Knowledge of virtualization technologies and virtual machine development and maintenance. • Knowledge of the organization's core business/mission processes. • Knowledge of emerging security issues, risks, and vulnerabilities.

Aligned Washington State Learning Standards	
Arts	
Computer Science	3A-NI-05 Give examples to illustrate how sensitive data can be affected by malware and other attacks. 3A-NI-06 Recommend security measures to address various scenarios based on factors such as efficiency, feasibility, and ethical impacts. 3A-NI-07 Compare various security measures, considering tradeoffs between the usability and security of a computing system. 3A-NI-08 Explain tradeoffs when selecting and implementing cybersecurity recommendations. 3B-IC-26 Evaluate the impact of equity, access, and influence on the distribution of computing resources in a global society. 3B-IC-28 Debate laws and regulations that impact the development and use of software.
Educational Technology	1.1.a Students articulate and set personal learning goals, develop strategies leveraging technology to achieve them and reflect on the learning process itself to improve learning outcomes. 1.1.b Students build networks and customize their learning environments in ways that support the learning process. 1.1.c Students use technology to seek feedback that informs and improves their practice and to demonstrate their learning in a variety of ways. 1.1.d Students understand the fundamental concepts of technology operations, demonstrate the ability to choose, use and troubleshoot current technologies and are able to transfer their knowledge to explore emerging technologies. 2.2.a Students cultivate and manage their digital identity and reputation and are aware of the permanence of their actions in the digital world. 2.2.b Students engage in positive, safe, legal and ethical behavior when using technology, including social interactions online or when using networked devices. 2.2.c Students demonstrate an understanding of and respect for the rights and obligations of using and sharing intellectual property. 2.2.d Students manage their personal data to maintain digital privacy and security and are aware of data-collection technology used to track their navigation online. 3.3.a Students plan and employ effective research strategies to locate information and other resources for their intellectual or creative pursuits. 3.3.b Students evaluate the accuracy, perspective, credibility and relevance of information, media, data or other resources. 3.3.c Students curate information from digital resources using a variety of tools and methods to create collections of artifacts that

	demonstrate meaningful connections or conclusions. 3.3.d Students build knowledge by actively exploring real-world issues and problems, developing ideas and theories and pursuing answers and solutions. 5.5.b Students collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making. 6.6.b Students create original works or responsibly repurpose or remix digital resources into new creations. 6.6.c Students communicate complex ideas clearly and effectively by creating or using a variety of digital objects such as visualizations, models or simulations. 6.6.d Students publish or present content that customizes the message and medium for their intended audiences. 7.7.a Students use digital tools to connect with learners from a variety of backgrounds and cultures, engaging with them in ways that broaden mutual understanding and learning.
English Language Arts	W 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. W 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. W 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. SL 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. SL 11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. L 11-12.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. L 11-12.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. L 11-12.6 Acquire and use accurately 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.
Environment & Sustainability	
Financial Education	
Health and Physical Education	
Mathematics	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. S-IC.6: Evaluate reports based on data.
Science	
Social Studies	H4.11-12.3 Analyze how current events today are rooted in past events.

COMPONENTS AND ASSESSMENTS
Performance Assessments: Students will work individually on the Cross-Site Scripting (XCS) research assignment. Students will demonstrate proficiency by writing a SQLi prevention plan that will be assessed by the instructor. Students will work in pairs to demonstrate proficiency in the Hack Walk Through Project. Students will be given a series of SQLi and XSS cyber-attacks that they will create on a secure website. After the attacks the students will create a presentation discussing the vulnerabilities they exploited and a plan for mitigating the various attacks. Students are checked for proficiency by both peers and the instructor. The end of unit objectives is also evaluated for mastery by using a quiz.
Leadership Alignment: Students will demonstrate the ability to **think creatively** and **produce results** through their **SQLI prevention plan**. Working in pairs students will demonstrate the ability to **adapt to change**, **make judgments and decisions,** and, **interpret and analyze information** by working together on the **Hack Walk Through Project**.

Standards and Competencies	
Unit 4: Software Security	
Industry Standards and/or Competencies	**Total Learning Hours for Unit: 30**

National Standards for Business Education (www.nbea.org)

Information Technology

I Impact on Society

Achievement Standard: Assess the impact of information technology in a global society.

Information Technology

II INFORMATION LITERACY

Achievement Standard: Gather, evaluate, use, cite, and disseminate information from technology sources.

Information Technology

III DIGITAL CITIZENSHIP

Achievement Standard: Demonstrate respectful, responsible and ethical behavior in a digital world.

Information Technology

XV SECURITY AND RISK MANAGEMENT

Achievement Standard: Design and implement security and risk management policies and procedures for information technology.

Competencies/Objectives

- Write basic SQL code
- Able to structure data, create queries, and filtering using SQL
- Skill in conducting vulnerability scans and recognizing vulnerabilities in security systems.
- Skill in analyzing network traffic capacity and performance characteristics.
- Skill in applying confidentiality, integrity, and availability principles.
- Skill in the use of penetration testing tools and techniques.
- Skill in the use of social engineering techniques. (e.g., phishing, baiting, tailgating, etc.).
- Skill in writing code in a currently supported programming language (e.g., Java, C++, SQL, JavaScript).

- Skill in talking to others to convey information effectively. - Knowledge of configuring and utilizing software-based computer protection tools (e.g., software firewalls, antivirus software, anti-spyware). - Knowledge of using network analysis tools to identify vulnerabilities. (e.g., fuzzing, nmap, etc.). - Skill in analyzing malware. - Skill in writing about facts and ideas in a clear, convincing, and organized manner.	
Aligned Washington State Learning Standards	
Arts	
Computer Science	3A-CS-01 Explain how abstractions hide the underlying implementation details of computing systems embedded in everyday objects. 3A-CS-02 Compare levels of abstraction and interactions between application software, system software, and hardware layers. 3A-CS-03 Develop guidelines that convey systematic troubleshooting strategies that others can use to identify and fix errors. 3A-NI-05 Give examples to illustrate how sensitive data can be affected by malware and other attacks. 3A-NI-06 Recommend security measures to address various scenarios based on factors such as efficiency, feasibility, and ethical impacts. 3A-NI-07 Compare various security measures, considering tradeoffs between the usability and security of a computing system. 3A-NI-08 Explain tradeoffs when selecting and implementing cybersecurity recommendations. 3A-DA-09 Translate between different bit representations of real-world phenomena, such as characters, numbers, and images.) 3B-NI-04 Compare ways software developers protect devices and information from unauthorized access.
Educational Technology	1.1.a Students articulate and set personal learning goals, develop strategies leveraging technology to achieve them and reflect on the learning process itself to improve learning outcomes. 1.1.b Students build networks and customize their learning environments in ways that support the learning process. 1.1.c Students use technology to seek feedback that informs and improves their practice and to demonstrate their learning in a variety of ways. 1.1.d Students understand the fundamental concepts of technology operations, demonstrate the ability to choose, use and troubleshoot current technologies and are able to transfer their knowledge to explore emerging technologies. 2.2.a Students cultivate and manage their digital identity and reputation and are aware of the permanence of their actions in the digital world. 2.2.b Students engage in positive, safe, legal and ethical behavior when using technology, including social interactions online or when using networked devices. 2.2.c Students demonstrate an understanding of and respect for the rights and obligations of using and sharing intellectual property. 2.2.d Students manage their personal data to maintain digital privacy and security and are aware of data-collection technology used to track their navigation online. 3.3.a Students plan and employ effective research strategies to locate information and other resources for their intellectual or creative pursuits. 3.3.b Students evaluate the accuracy, perspective, credibility and relevance of information, media, data or other resources. 3.3.c Students curate information from digital resources using a variety of tools and methods to create collections of artifacts that demonstrate meaningful connections or conclusions. 3.3.d Students build knowledge by actively exploring real-world issues and problems, developing ideas and theories and pursuing answers and solutions. 5.5.b Students collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making. 6.6.b Students create original works or responsibly repurpose or remix digital resources into new creations. 6.6.c Students communicate complex ideas clearly and effectively by creating or using a variety of digital objects such as visualizations, models or simulations.

	6.6.d Students publish or present content that customizes the message and medium for their intended audiences. 7.7.a Students use digital tools to connect with learners from a variety of backgrounds and cultures, engaging with them in ways that broaden mutual understanding and learning
English Language Arts	W 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. W 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. W 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. SL 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. SL 11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. L 11-12.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. L 11-12.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. L 11-12.6 Acquire and use accurately 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.
Environment & Sustainability	
Financial Education	
Health and Physical Education	
Mathematics	
Science	
Social Studies	

COMPONENTS AND ASSESSMENTS	
Performance Assessments: Students will work in pairs to complete a series of PacketTracer labs. Students will demonstrate proficiency by completing the labs and will be assessed by the instructor. Students will work individually to complete the Careers in Cybersecurity project. Students will explore the various job opportunities in the computer science cyber security field. Students will research job demand, skills needed, salaries, industry certifications, and future employment outlook. Students are checked for proficiency by the instructor. The end of unit objectives is also evaluated for mastery by using a quiz.	
Leadership Alignment: Students will demonstrate the ability to **produce results**, **interact effectively with others** in a **diverse team setting** through their **Securing a Network Project**.	
Standards and Competencies	
Unit 5: Networking Fundamentals	
Industry Standards and/or Competencies	**Total Learning Hours for Unit: 35**

National Standards for Business Education (www.nbea.org)

XIII DATA AND NETWORKING INFRASTRUCTURES

Achievement Standard: Develop the skills to design, deploy, and administer networks and telecommunications systems.

Information Technology

XV SECURITY AND RISK MANAGEMENT

Achievement Standard: Design and implement security and risk management policies and procedures for information technology.

Competencies/Objectives

- Explain the TCP/IP protocol stack
- Explain the basic concepts of IP addressing
- Explain the binary, octal, and hexadecimal numbering systems
- Explain the role of a protocol when two or more computers attempt to communicate with each other.
- Write basic SQL code
- Able to structure data, create queries, and filtering using SQL
- Identify basic network connectivity concepts
- Apply basic networking terminology to a network environment
- Identify and use basic networking resources
- Configure basic networking devices and security
- Identify network connectivity hardware and related software
- Identify network architecture and topologies
- Identify and distinguish network protocols, standards, and theoretical models in actual implementations
- Identify network hardware infrastructure components including networking media and connection hardware and software
- Design and develop network infrastructure
- Knowledge of network servers, routers, clients, and related hardware and software

- Apply virtualization technology to servers, networks, storage and related infrastructure
- Configure and manage network operating systems in multi-vendor environments
- Implement hardware and software security solutions
- Monitor and fortify network security
- Obtain telecommunications and networking industry certification(s)
- Develop networking strategic plans
- Develop policies, protocols and procedures for maintaining enterprising networks
- Skill in conducting vulnerability scans and recognizing vulnerabilities in security systems.
- Skill in analyzing network traffic capacity and performance characteristics.
- Skill in applying confidentiality, integrity, and availability principles.
- Skill in the use of penetration testing tools and techniques.
- Skill in the use of social engineering techniques. (e.g., phishing, baiting, tailgating, etc.).
- Skill in writing code in a currently supported programming language
- Knowledge of software-based computer protection tools (e.g., software firewalls, antivirus software, anti-spyware).
- Skill in using network analysis tools to identify vulnerabilities. (e.g., fuzzing, nmap, etc.).
- Skill in configuring and utilizing network protection components (e.g., Firewalls, VPNs, network intrusion detection systems).
- Skill in analyzing malware.
- Skill in performing packet-level analysis.
- Skill in analyzing traffic to identify network devices.
- Skill in reverse engineering (e.g., hex editing, binary packaging utilities, debugging, and strings analysis) to identify function and ownership of remote tools.
- Skill in writing about facts and ideas in a clear, convincing, and organized manner.

Aligned Washington State Learning Standards	
Arts	
Computer Science	3A-CS-03 Develop guidelines that convey systematic troubleshooting strategies that others can use to identify and fix errors. 3A-NI-04 Evaluate the scalability and reliability of networks, by describing the relationship between routers, switches, servers, topology, and addressing. 3A-NI-05 Give examples to illustrate how sensitive data can be affected by malware and other attacks. 3A-NI-06 Recommend security measures to address various scenarios based on factors such as efficiency, feasibility, and ethical impacts. 3A-NI-07 Compare various security measures, considering tradeoffs between the usability and security of a computing system. 3A-NI-08 Explain tradeoffs when selecting and implementing cybersecurity recommendations. 3B-NI-03 Describe the issues that impact network functionality (e.g., bandwidth, load, delay, topology). 3B-NI-04 Compare ways software developers protect devices and information from unauthorized access. 3B-IC-26 Evaluate the impact of equity, access, and influence on the distribution of computing resources in a global society.
Educational Technology	1.1.a Students articulate and set personal learning goals, develop strategies leveraging technology to achieve them and reflect on the learning process itself to improve learning outcomes. 1.1.b Students build networks and customize their learning environments in ways that support the learning process. 1.1.c Students use technology to seek feedback that informs and improves their practice and to demonstrate their learning in a variety of ways. 1.1.d Students understand the fundamental concepts of technology operations, demonstrate the ability to choose, use and troubleshoot current technologies and are able to transfer their knowledge to explore emerging technologies. 2.2.a Students cultivate and manage their digital identity and reputation and are aware of the permanence of their actions in the digital world.

	2.2.b Students engage in positive, safe, legal and ethical behavior when using technology, including social interactions online or when using networked devices. 2.2.c Students demonstrate an understanding of and respect for the rights and obligations of using and sharing intellectual property. 2.2.d Students manage their personal data to maintain digital privacy and security and are aware of data-collection technology used to track their navigation online. 3.3.a Students plan and employ effective research strategies to locate information and other resources for their intellectual or creative pursuits. 3.3.b Students evaluate the accuracy, perspective, credibility and relevance of information, media, data or other resources. 3.3.c Students curate information from digital resources using a variety of tools and methods to create collections of artifacts that demonstrate meaningful connections or conclusions. 3.3.d Students build knowledge by actively exploring real-world issues and problems, developing ideas and theories and pursuing answers and solutions. 5.5.b Students collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making. 6.6.b Students create original works or responsibly repurpose or remix digital resources into new creations. 6.6.c Students communicate complex ideas clearly and effectively by creating or using a variety of digital objects such as visualizations, models or simulations. 6.6.d Students publish or present content that customizes the message and medium for their intended audiences. 7.7.a Students use digital tools to connect with learners from a variety of backgrounds and cultures, engaging with them in ways that broaden mutual understanding and learning
English Language Arts	W 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. W 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. W 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. SL 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. SL 11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. L 11-12.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. L 11-12.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. L 11-12.6 Acquire and use accurately 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.
Environment & Sustainability	
Financial Education	

Health and Physical Education	
Mathematics	S-IC.6: Evaluate reports based on data.
Science	
Social Studies	

COMPONENTS AND ASSESSMENTS	
Performance Assessments: Students will work individually to complete a final review packet and will then take the course final summative exam. Students are checked for proficiency by the instructor. Students work in groups of 2-4 to create their own Cybersecurity Project or select from project options provided by the instructor. Groups will present their work to the class. Students are checked for proficiency by peers and the instructor. Some students will begin work on preparing to take the MTA Networking certification.	
Leadership Alignment: Students will demonstrate the ability to **produce results**, **interact effectively with others** in a **diverse team setting** through their **Final Cybersecurity Project**.	
Standards and Competencies	
Unit 5: Review and Industry Certifications	
Industry Standards and/or Competencies	**Total Learning Hours for Unit:15**

National Standards for Business Education (www.nbea.org)

XIII DATA AND NETWORKING INFRASTRUCTURES

Achievement Standard: Develop the skills to design, deploy, and administer networks and telecommunications systems.

Information Technology

XV SECURITY AND RISK MANAGEMENT

Achievement Standard: Design and implement security and risk management policies and procedures for information technology.

Competencies/Objectives

- Write basic SQL code
- Able to structure data, create queries, and filtering using SQL
- Identify basic network connectivity concepts
- Apply basic networking terminology to a network environment
- Identify and use basic networking resources
- Configure basic networking devices and security
- Identify network connectivity hardware and related software
- Identify network architecture and topologies
- Identify and distinguish network protocols, standards, and theoretical models in actual implementations
- Identify network hardware infrastructure components including networking media and connection hardware and software
- Design and develop network infrastructure
- Install and configure network servers, routers, clients, and related hardware and software
- Monitor and manage computer networks
- Apply virtualization technology to servers, networks, storage and related infrastructure
- Configure and manage network operating systems in multi-vendor environments
- Implement hardware and software security solutions
- Monitor and fortify network security
- Obtain telecommunications and networking industry certification(s)
- Develop networking strategic plans

• Develop policies, protocols and procedures for maintaining enterprising networks • Skill in conducting vulnerability scans and recognizing vulnerabilities in security systems. • Skill in analyzing network traffic capacity and performance characteristics. • Skill in applying confidentiality, integrity, and availability principles. • Skill in the use of penetration testing tools and techniques. • Skill in the use of social engineering techniques. (e.g., phishing, baiting, tailgating, etc.). • Skill in tuning sensors. • Skill in using knowledge management technologies. • Skill in using network management tools to analyze network traffic patterns (e.g., simple network management protocol). • Skill in using protocol analyzers. • Skill in writing code in a currently supported programming language (e.g., Java, C++). • Skill in developing and executing technical training programs and curricula. • Skill in talking to others to convey information effectively. • Skill in configuring and utilizing software-based computer protection tools (e.g., software firewalls, antivirus software, anti-spyware). • Skill in using network analysis tools to identify vulnerabilities. (e.g., fuzzing, nmap, etc.). • Skill in configuring and utilizing network protection components (e.g., Firewalls, VPNs, network intrusion detection systems). • Skill in applying security controls. • Skill in analyzing malware. • Skill in performing packet-level analysis. • Skill in analyzing traffic to identify network devices. • Skill in reverse engineering (e.g., hex editing, binary packaging utilities, debugging, and strings analysis) to identify function and ownership of remote tools. • Skill in writing about facts and ideas in a clear, convincing, and organized manner.

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Environment & Sustainability	
Financial Education	

Health and Physical Education	
Mathematics	
Science	
Social Studies	

21st Century Skills		
Check those that students will demonstrate in this course:		
LEARNING & INNOVATION **Creativity and Innovation** ☒Think Creatively ☒Work Creatively with Others ☐Implement Innovations **Critical Thinking and Problem Solving** ☒Reason Effectively ☒**U**se Systems Thinking ☒Make Judgments and Decisions ☒Solve Problems **Communication and Collaboration** ☒Communicate Clearly ☒Collaborate with Others	**INFORMATION, MEDIA & TECHNOLOGY SKILLS** **Information Literacy** ☒Access and /evaluate Information ☒Use and Manage Information **Media Literacy** ☐Analyze Media ☐Create Media Products **Information, Communications and Technology (ICT Literacy)** ☒Apply Technology Effectively	**LIFE & CAREER SKILLS** **Flexibility and Adaptability** ☒Adapt to Change ☒Be Flexible **Initiative and Self-Direction** ☒Manage Goals and Time ☒Work Independently ☒Be Self-Directed Learners **Social and Cross-Cultural** ☒Interact Effectively with Others ☒Work Effectively in Diverse Teams **Productivity and Accountability** ☒Manage Projects ☒Produce Results **Leadership and Responsibility** ☐Guide and Lead Others ☒Be Responsible to Others