Fundamentals of Cyber Security

Contact Information

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Course Description

As our world becomes increasingly dependent on technology, cybersecurity is a topic of growing importance. It is crucial that companies and individuals take precautions to protect themselves from the growing threat of cyber attacks. This course prepares students with crucial skills to be responsible citizens in a digital future.

Fundamentals of Cybersecurity is a blended K12 cyber security course. This quarter-long version is designed for students with some exposure to computer science, but there are no specific course prerequisites. Students will learn foundational cybersecurity topics including networking fundamentals, software security, system administration and the basics of cryptography and programming, all through the CodeHS web-based platform. This is not a coding intensive course, but students will learn basic SQL and JavaScript, and will utilize basic HTML and JavaScript within specific contexts while being provided with support within those contexts.

Student Learning Outcomes

PC. 1: Students will have **programming knowledge** skills that allow students to develop solutions to novel problems.

- EU 1.1 Programs can be developed for creative expression, to satisfy personal curiosity, to create new knowledge, or to solve problems (to help people, organizations, or society).
- EU 1.2 People write programs to execute algorithms.
- EU 1.3 Programming is facilitated by appropriate abstractions.
- EU 1.4 Programs are developed, maintained, and used by people for different purposes.
- EU 1.5 A variety of abstractions built on binary sequences can be used to represent all digital data.
- EU 1.6 Multiple levels of abstraction are used to write programs or create other computational artifacts.

- EU 1.7 Computing facilitates exploration and the discovery of connections in information.
- EU 1.8 There are trade-offs when representing information as digital data.

PC. 3: Students will effectively **design and communicate** to be contributing team members

- EU 3.1 Creative development can be an essential process for creating computational artifacts.
- EU 3.2 Computing enables people to use creative development processes to create computational artifacts for creative expression or to solve a problem.
- EU 3.3 Computing can extend traditional forms of human expression and experience.
- EU 3.4 Incorporating multiple perspectives through collaboration improves computing innovations as they are developed.
- EU 3.5 Developers create and innovate using an iterative design process that is user-focused, that incorporates implementation/feedback cycles, and that leaves ample room for experimentation and risk-taking.

PC. 5: Students will have an understanding of the **User Experience** when it comes to programming.

- EU 5.1 The Internet is a network of autonomous systems.
- EU 5.2 Characteristics of the Internet influence the systems built on it.
- EU 5.3 Cybersecurity is an important concern for the Internet and the systems built on it.
- EU 5.4 Computing has a global affect — both beneficial and harmful — on people and society.
- EU 5.5 Computing innovations influence and are influenced by the economic, social, and cultural contexts in which they are designed and used.

Course Requirements

The Fundamentals of Cybersecurity course is designed for beginners to intermediate computer science students with at least some knowledge and interest in computer science. The course is highly visual, dynamic, and interactive, making it engaging for those new to computer science.

Student Evaluation

Work Ethics	25%
Projects	35%
Challenges	25%
Exercises	15%

4 Projects

Public Service Announcement

Students explore the basics of cybersecurity. Students will learn about why cybersecurity is important, recent threats to cybersecurity, and different careers in the field. Students learn about Internet etiquette and how to stay safe on the world wide web. Students also look at the potential effects of our digital footprints, how to protect information from online risks, and the implications of cyberbullying. Finally, the module includes how to find and cite quality resources online. For this project, students create a Public Service Announcement (PSA) to teach their peers about digital citizenship and cyber hygiene. Students can select any of the topics covered so far.

Competency assessed: PC.5

Classic Cipher Newscast

Students learn the fundamentals of programming including variables, arrays, and objects as well as the difference in interpreted and compiled languages. Students explore programming through block coding which includes conditional statements and control structures. Students dive into the history of cryptography systems, the motivation behind using encryption systems, and basic cryptography systems. Additionally, students explore topics on how to use cryptography, cryptology, and cryptanalysis to decode a message without the use of a key. In this project, students will get to create a newscast! This could be pre-recorded or presented live. Students will write, rehearse, and perform an approximately 5 – 10 minute newscast with their team. Each team will be given a different **classic cipher** (beyond Caesar and Vigenere) to research and address in their newscast.

Competency assessed: PC.1

Security Assessment Report

Students compare and contrast common operating systems (Windows, Linux, OS) and explain the importance of application security. Students investigate security options and implement user accounts to enforce authentication and authorization. Students also demonstrate how to work with basic and advanced command prompts. Students learn what happens when running a web application and how to look inside web apps using developer tools, source code, and more. Students learn basic SQL and common attacks like SQLi, and by the end of the module, students will be able to recommend solutions for flawed security systems. In this project, students work as a consultant to a (fake) reputable company. They are tasked with testing the company's website for SQL injection and writing a security assessment report based on your findings.

Competency assessed: PC.3

Troubleshooting

Students explore the structure and design of the internet and networks, and how this design affects the reliability of network communication, the security of data, and personal privacy. Students learn how the Internet connects computers all over the world by using networking protocols. Students learn about the physical elements of computers and networking, such as motherboards, RAM, routers, and the use of port numbers, ethernet, and wireless devices. In this project, students explore the troubleshooting methodology and utilize it to solve sample IT support issues.

Competency assessed: PC.5

Ethical Behavior

This course's philosophy on academic honesty is best stated as "be reasonable." This course recognizes that interactions with classmates and others can facilitate mastery of the course's material. However, there remains a line between enlisting the help of another and submitting the work of another.

The essence of all work that you submit to the course must be your own. Collaboration on problems is not permitted (unless explicitly stated otherwise) except to the extent that you may ask classmates and others for help so long as that help does not reduce to another doing your work for you. Generally speaking, when

asking for help, you may show your code or writing to others, but you may not view theirs, so long as you and they respect this policy's other constraints.

Late work

Assignments are due on the announced due date. It is your responsibility to keep up with class activities and assignments and request missing assignments due to absence. Upon returning from an excused absence, students will be given two days for each day absence to make up missed assignments. All students work at a different pace and will be graded primarily on their quality of work and productivity level during class. As long as the students are highly productive each day and producing work of high quality, they will receive excellent grades. Extensions will also be available upon request.

Food/Drink

Food and drinks are not permitted near the computer stations. There will be dedicated stations for water bottles or snacking.

Electronic Devices

Phones and other electronic devices are allowed in class if they do not become a distraction (texting, playing games, checking social media, web browsing, etc.). Students who are regularly off task or behind in their work, will have their phone privileges revoked. However, during instructional time, tests and quizzes, electronic devices are not to be used at all (unless directed to by the teacher). The CTC has a general no cellphones during instruction time policy. This means your phone should not be visible during lecture, going over examples, group work. You will get one warning to put the phone away. If we are working on individual work you are welcome to ask to use your phone, if you don't ask permission you will get a warning. After the warning your phone will go into one of the phone jails and you can collect it at the end of the class.

Computer Use

The classroom computers and related devices are to be used for classwork only. Do not download any files or programs not related to your classwork. Do not change the Login screen background. Do not install any program without permission of the teacher. Do not run any unapproved programs (Minecraft, Call of Duty, Halo, etc.), even from a network, external drive or remote device. Do not view or download any images, videos, or sound files that are offensive, racist, promote violence or drug use, etc.

Outline

- **Public Service Announcement**
  - **What is Cybersecurity?**: Students explore the basics of cybersecurity. Students will learn about why cybersecurity is important, recent threats to cybersecurity, and different careers in the field.
  - **Digital Citizenship and Cyber Hygiene**: Students learn about Internet etiquette and how to stay safe on the world wide web. Students also look at the potential effects of our digital footprints, how to protect information from online risks, and the implications of cyberbullying. Finally, the module includes how to find and cite quality resources online.

- **Classic Cipher Newscast**
  - **Programming Fundamentals**: Students learn the fundamentals of programming including variables, arrays, and objects as well as the difference in interpreted and compiled languages. Students explore programming through block coding which includes conditional statements and control structures.
  - **The ABCs of Cryptography**: Students dive into the history of cryptography systems, the motivation behind using encryption systems, and basic cryptography systems. Additionally, students explore topics on how to use cryptography, cryptology, and cryptanalysis to decode a message without the use of a key.

- **Security Assessment Report**
  - **System Administration**: Students compare and contrast common operating systems (Windows, Linux, OS) and explain the importance of application security. Students investigate security options and implement user accounts to enforce authentication and authorization. Students also demonstrate how to work with basic and advanced command prompts.
  - **Software Security**: Students learn what happens when running a web application and how to look inside web apps using developer tools, source code, and more. Students learn basic SQL and common attacks like SQLi, and by the end of the module, students will be able to recommend solutions for flawed security systems.

- **Troubleshooting**
  - **Networking Fundamentals**: Students explore the structure and design of the internet and networks, and how this design affects the reliability of network communication, the security of data, and personal privacy. Students learn how the Internet connects computers all over the world by using networking protocols.
  - **IT Infrastructure**: Students learn about the physical elements of computers and networking, such as motherboards, RAM, routers, and the use of port numbers, ethernet, and wireless devices.