Nebraska Introduction to Computer Science and Technology Syllabus

High School (125 Contact Hours)

Course Overview and Goals

This introductory course develops students' abilities to analyze, evaluate, and reflect upon technologies such as computer hardware, computer software, networking, and security. Students will learn the fundamentals of programming, build computational thinking skills, and reflect on the impact of computing on society.

Learning Environment

The course utilizes a blended classroom approach. The content is fully web-based, with students writing and running code in the browser. Teachers utilize tools and resources provided by CodeHS to leverage time in the classroom and give focused 1-on-1 attention to students. Each unit of the course is broken down into lessons. Lessons are made up of short video tutorials, example programs, quizzes, simulations, programming exercises, and free-response prompts. Each unit ends with a comprehensive unit quiz that assesses students' mastery of that unit's material.

Programming Environment

Students write and run programs in the browser using the CodeHS editor. The first programming module is in Python and utilizes Tracy the Turtle to teach basic programming concepts. The second continues working with Python in the console. There is also a JavaScript programming unit in the supplemental modules that can be swapped out and used instead of one of these modules. Only one programming module is necessary to hit all required standards. The second programming module is for enrichment.

More Information

Browse the content of this course at https://codehs.com/course/23283/explore

Technology Requirements

To complete all activities and exercises in this course, students must have access to the 3rd party sites and tools listed here: NE Introduction to Computer Science Links

Prerequisites

The Nebraska Introduction to Computer Science and Technology Syllabus course is designed for complete beginners with no previous background in computer science. The course is highly visual, dynamic, and interactive, making it engaging for those new to computer science.

Course Breakdown

Module 1: Cybersecurity and You (3 weeks/15 hours)

In this module, students delve into key areas such as personal data collection, the reliability of online information, cyber ethics and laws, personal data security, cybersecurity essentials, and strategies to combat common cyber threats and their prevention, equipping individuals with the knowledge to navigate the digital landscape responsibly and securely.

Browse the full content of this unit at https://codehs.com/course/23283/explore/module/31952

Topics Covered	• Digital Footprint and Responsibility • Personal Data Collection and Security • Cyber Ethics and Laws • Cybersecurity Essentials • Common Cyber Attacks and Prevention

Example Assignments	• Digital Footprint and Responsibility
	  ○ Students explore the impact of social media and technology on teenagers, covering topics like digital footprints, the rise of social media screenings, cyberbullying, and the importance of updating privacy settings.
	• Personal Data Collection and Security
	  ○ This lesson delves into the use and security of personal data, discussing how companies like Google utilize user information, the implications of location tracking, legal aspects of privacy, and encourages critical thinking through reflections, checks for understanding, and explorations of browser security settings and the trade-offs of security measures.
	• Cyber Ethics and Laws
	  ○ This lesson navigates through cyber ethics, differentiating between ethics and laws, exploring legal consequences, copyright in education, the process of obtaining permissions, and the pros and cons of intellectual property laws.
	• Cybersecurity Essentials
	  ○ This lesson covers cybersecurity, featuring activities on the AAA Security Framework and the CIA Triad, along with exploring the impact of the Internet of Things on data security.

Module 2: Cryptography (2 weeks/10 hours)

In this module, students will dive into the history of cryptography systems, the motivation behind using encryption systems, and modern cryptography systems. This includes explaining the core concepts of Public Key Infrastructure and hash functions. Students will also explore the importance of digital certificates, and authentication methods.

Browse the full content of this module at https://codehs.com/course/23283/explore/module/31953

Topics Covered	• Cryptography: Then, Now and Future • Symmetric Encryption • Asymmetric Encryption • Public Key Encryption • Authentication Methods • Digital Certificates
Example Assignments	• Symmetric Encryption

	○ *Rail Fence Cipher:* The Rail Fence Cipher is a form of transposition cipher that uses columns and rows. The plaintext is written downwards and bounces back and forth on a diagonal. The 'rails' refer to the number of rows. Decrypt the message below using 5 rails. Using the Rail Fence Cipher, encrypt your own message and trade with a partner. See if you can decrypt the message without knowing how many rails your partner used. How could you make this cipher even stronger? ● Asymmetric Encryption ○ *Public Key Encryption Exploration*: You would like to send a message to your friend. Your friend will need a private key as well to add to the encryption. Complete the chart according to the rules of the public key and the two private keys. ● Authentication Methods ○ *Guess The Hash:* Work with a partner and take turns hiding a password, and trying to guess the password. Without letting your partner see, type in a simple word (about 3-7 letters long) as your password. You'll see the corresponding hash in the output box. Using the scrambled letters, attempt to guess the password. You will only know if you have guessed the password if the hashes shown match.

Module 3: Project: Create an Escape Room (1 week/5 hours)

In this project, students will create an escape room using what they have learned about ciphers and cryptography.

Browse the full content of this module at https://codehs.com/course/23283/explore/module/31954

Topics Covered	● Ciphers ● Cryptographic puzzles ● Testing
Example Assignments	● Step 1: Define Your Theme and Storyline ○ Choose a theme for your escape room (spy mission, historical mystery, fantasy adventure, etc). ● Step 2: Create Cryptographic Puzzles ○ Select at least three different types of cryptographic puzzles. A cryptographic puzzle uses a cipher and a key to hide a message. ○ Create the actual cryptographic puzzles. Ensure that the difficulty level is set appropriately (not too hard or too easy). ○ Align the puzzles to the theme and storyline of the escape room. ● Step 3: Create a Room Layout ○ Design a physical or a digital escape room using the cryptographic puzzles. ○ Incorporate clues, hints, and any necessary props. ● Step 4: Test The Escape Room ○ Conduct a full run-through of the escape room with a group of testers to identify any potential issues. ○ Gather feedback on the overall experience and adjust elements as necessary. ● Step 5: Finalize Details

	○ Make any final adjustments based on feedback and testing results. ○ Ensure all elements, including clues, props, and cryptographic puzzles, are ready for participants.

Module 4: System Administration (3 weeks/15 hours)

In this module, students will compare and contrast common operating systems (Windows, Linux, OS) and explain the importance of application security. They will investigate security options and implement user accounts to enforce authentication and authorization. Students will also demonstrate how to work with basic and advanced command prompts.

Browse the full content of this module at https://codehs.com/course/23283/explore/module/31955

Topics Covered	● Operating Systems ● Software and Applications ● Application Security ● Browser Configuration ● System Administration ● Command Line Interface
Example Assignments	● Understanding Operating Systems ● Comparing Operating Systems ○ Installing an OS ● File Management ○ What Processor are you Running? ● Software Licenses ● Antivirus Software ○ Data Backups ● Using Cache ● Popup Blockers ● User Accounts ○ Admin vs. Standard ● Host Security ○ Using a Log ● System Commands ○ cd, ls, mk etc ● Network Commands ○ ipconfig, netstat etc

Module 5: IT Concepts (3 weeks/15 hours)

In this module, 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 will learn how the Internet connects computers all over the world by use of networking protocols.

Browse the full content of this module at https://codehs.com/course/23283/explore/module/31956

Topics Covered	● Binary ● Encoding Text and Images in Binary ● IP Addresses ● Routing and Packets

	• Protocols: TCP, UDP, HTTP/HTTPS • How do Websites Work? • OSI Model • Impact of the Internet
Example Assignments	• Write a Message in Binary • Create a Color Pixel Image • Routing with ARPANET • Journey of a Web Page • Troubleshooting with the OSI Model • Compass Points: The Internet ○ In this activity, students use the Compass Points thinking routine to examine your feelings about the internet and its impact on society.

Module 6: IT Infrastructure (2 weeks/10 hours)

In this module, Students will learn about the physical elements of computers and networking such as motherboards, RAM, routers, and the use of port numbers, ethernet, and wireless devices.

Browse the full content of this module at https://codehs.com/course/23283/explore/module/31957

Topics Covered	• Internal Components of a Computer • Peripheral Devices • Network Devices • Storage and Network Options • Network Communication • Network Management

Example Assignments	• Different Types of CPU
	• RAM vs. Hard Drive
	• Wireless Internet Connections
	  ○ Speed Test
	• Security of Cloud Storage
	• Ethernet Standards
	• Setting Up a Firewall
	  ○ Establish Firewall Rules
	• SSH Logs
	  ○ Reading Logs

Module 7: Project: Troubleshooting (0.5 week/2 hours)

In this project, students will explore the troubleshooting methodology and utilize it to solve sample IT support issues.

Browse the full content of this module at https://codehs.com/course/23283/explore/module/31958

Topics Covered	• Troubleshooting Methodology
	  ○ Identify the problem
	  ○ Research past solutions
	  ○ Establish a theory
	  ○ Test the theory
	  ○ Establish a plan of action
	  ○ Implement the solution

	○ Verify functionality ○ Document findings
Example Assignments	● Troubleshooting: In this project, students will learn more about each step of the troubleshooting methodology and use these steps to repair and improve faulty network systems. ○ Poor Signal Strength ○ Interference

Module 8: Programming with Turtle Graphics (3 weeks/15 hours)

In this module, students learn the basics of programming using Python and Tracy the Turtle. They learn Python commands, functions, control structures, and user interaction by solving puzzles and writing creative programs for Tracy to follow.

Browse the full content of this module at https://codehs.com/course/23283/explore/module/31959

Topics Covered	● What is a Command? ● Moving Tracy ● Tracy's Coordinate System ● For Loops ● Functions and Parameters ● Top Down Design ● Abstraction ● Variables ● User Input ● If/Else Statements ● While Loops
Example Assignments	● Row of Circles ○ In this program, students will have Tracy draw a row of circles across the width of the canvas using a for loop. ● Bubble Wrap 2.0 ○ In this program, students will have Tracy add highlights to each bubble from our Bubble Wrap example program. They will use top down design to break this large problem into smaller pieces! ● Beaded Bracelet ○ In this program, students will have Tracy create a beaded bracelet using functions and circles. ● Four Colored Triangles ○ In this program, students will have Tracy draw four tri-colored triangles next to one another in the center of the canvas.

Module 9: Programming in Python (3 weeks/15 hours)

Students learn the fundamentals of programming in Python by running example code and completing relevant coding exercises. This module can be used in place of Tracy the Turtle.

Browse the full content of this module at https://codehs.com/course/23283/explore/module/31961

Topics Covered	● Introduction to Python ● Printing in Python ● Variables and Types

	• User Input • Mathematical Operators • String Operators

Example Assignments	• Printing in Python
	  ○ Students write a program that prints their name and something about themselves.
	• Variables and Types
	  ○ Write a program that does the following:
	  ■ Creates a string variable.
	  ■ Creates an integer variable.
	  ■ Prints both variables, each on its own line.
	• User Input
	  ○ Write a program that takes a user's name and says hello to them. Save their name in a variable.

Module 10: Project: Password Authenticator (0.5 weeks/3 hours)

Students write a program to provide feedback on whether the entered password is correct or incorrect.

Browse the full content of this module at https://codehs.com/course/23283/explore/module/36884

Objectives / Topics Covered	• Variables • User Input • Boolean Operations • Loops • Control Structures
Project Description	• Create a password authentication program that prompts the user to enter a password. The program should compare the entered password with a predefined correct password and provide feedback on whether the entered password is correct or incorrect. The program should allow the user to try again a limited number of times before locking them out.

Module 11: Data Security (4 weeks/20 hours)

In this module, students will learn about the benefits and dangers of collecting and storing large sets of data. They will learn how to prevent attacks such as SQLi and XSS using programming controls. Students will also learn about risk management and how to identify, assess, prioritize, and minimize risks.

Browse the full content of this module at https://codehs.com/course/23283/explore/module/36882

Topics Covered	• Data as a Resource • Databases • Security in Coding • Environmental Controls • Risk Management

Example Assignments	• Databases
	  ○ *SQL Query Exploration:* In this activity, students will explore a database using the SQL query language.
	• SQLi
	  ○ *Can you gain access?:* The database in this item lists 100 of the most commonly used passwords. Attempt to gain access to a single

	record by guessing the password. Remember, this is a database of 100 of the most commonly used passwords. Can you guess at least 3 of them? How many can you guess? ● XSS ○ *XSS Tutorial:* In this activity, students will perform simulated Cross Site Scripting (XSS) attacks on vulnerable websites using unprotected input fields. ● Security in Coding ○ *Capture the Flag:* Within this lesson, students will have the opportunity to find "flags" by locating specific information using the View Page Source feature as well as other features that they will learn about. ● Risk Management ○ *CyberGuard High School:* You have just started a new job as the network administrator for CyberGuard High School. Throughout the next few activities, you will go through the Risk Management process to develop a Risk Management plan for CyberGuard High.

Supplemental Module: Programming in JavaScript (3 weeks/15 hours)

Students learn the fundamentals of programming in JavaScript by running example code and completing relevant coding exercises. This module can be used in place of Tracy the Turtle.

Browse the full content of this module at https://codehs.com/course/23283/explore/module/31964

Topics Covered	● Variables ● User Input ● Random Numbers ● Functions ● If/Else Statements ● Logical & Comparison Operators ● While Loops ● For Loops
Example Assignments	● Using variables and getting user input using JavaScript ○ Example Exercise: Dinner Plans ■ Prompt the user for their name, then ask them what time you should meet for dinner. Greet them by name and tell them you will meet them at the time they specified! ● Using comparison and logical operators to control the flow of the program ○ Example Exercise: Inventory ■ Write a program that keeps track of a simple inventory for a store. While there are still items left in the inventory, ask the user how many items they would like to buy. Then print out how many are left in inventory after the purchase. You should use a while loop for this problem. ● Using for loops ○ Example Exercise: Chalkboard ■ You have just gotten in trouble in school for coming late. The punishment is that you have to write "I will not come late to

	school" 100 times on the board. That would take you a while to do... but luckily you have for loops. Using a for loop, print "I will not come late to school" 100 times.