CodeHS

Nevada Computer Science & Applications Course Syllabus
1 semester for Middle/High School

Course Overview and Goals

The CodeHS Computer Science & Applications curriculum teaches the foundations of computer science and basic programming, with an emphasis on helping students develop logical thinking and problem solving skills. Students learn about computer science and computational thinking using Python and HTML to analyze and design solutions to problems using programming skills. Additional topics include algorithms, documentation, security and privacy, communication and collaboration, and data visualization.

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 consist of video tutorials, short quizzes, example programs to explore, and written programming exercises, adding up to over 100 hours of hands-on programming practice in total. Each unit ends with a comprehensive unit test that assesses student's mastery of the material from that unit as well as challenge problems where students can display their understanding of the material.

Programming Environment: Students write and run programs using Python, HTML, & CSS in the browser using the CodeHS editor.

More information: Browse the content of this course at https://codehs.com/course/6228

Prerequisites: The Computer Science & Applications 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 new coders.

Course Breakdown

Module 1: Welcome (.5 weeks/1-2 hours)

Module one introduces students to the course and gives an overview of topics that they will learn. Students will also develop goals for themselves and the course as well as investigate what type of learner they are.
Browse the full content of this unit at https://codehs.com/library/course/6228/module/9282

Objectives / Topics Covered	● Course Overview ● Learning Goals ● VARK Quiz & Reflection

Assignments / Labs	● Student set goals for the course
	      Before getting started, take a minute to set some goals for yourself. If we take the time to set goals now, we will be more likely to be successful in achieving them by the end of this course!
	
	      Answer the following questions:

	1. What am I hoping to create or learn in this class? How will I know if I met these goals? 2. How will my success in this class help me with my future education and career goals? 3. What do I need to do to meet my class goals? 4. What do I need from other people to meet my class goals?

Module 2: Digital Citizenship and Cyber Hygiene (2-3 weeks/10-15 hours)

This module includes topics on Internet etiquette and how to stay safe on the world wide web. We will 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.
Browse the full content of this module at https://codehs.com/library/course/6228/module/8858

Objectives / Topics Covered	● Digital Footprint and Reputation ● Cyberbullying ● Internet Safety ● Privacy and Security ● Information Literacy ● Creative Credit and Copyright ● Hacking Ethics

Example Assignments / Labs	● Digital Footprint and Reputation
	  ○ What is a digital footprint?
	  ○ What is *your* digital footprint and reputation?
	  ○ What does it mean that the internet is public and permanent?
	  ○ Who looks at your digital footprint and reputation?
	  ○ What are some recommended social media guidelines?
	  ○ How can you maintain your digital footprint?
	  ○ What does your digital footprint say about you?
	  ○ Example activities:
	    ■ What is your digital footprint?
	    ■ Are you going to make any changes in what you post on social media?
	● Cyberbullying
	  ○ What is cyberbullying?
	  ○ What are the impacts of cyberbullying?
	  ○ Are there cyberbullying roles?
	  ○ What do you do if you are being bullied?
	  ○ What do you do if you see bullying?
	  ○ How can you be an upstander?
	  ○ Example activities:
	    ■ Explore cyberbullying scenarios: What would you do?
	● Internet Safety
	  ○ What are some ways to stay safe online?
	  ○ What are some online safety guidelines?
	  ○ Example activities:
	    ■ Explore Internet safety scenarios: What would you do?
	● Privacy and Security
	  ○ What are data privacy and security?
	  ○ How can you keep personal data secure and private?

- ○ What can happen if you data is stolen and what can you do about it?
- ○ Example activities:
  - Test out various passwords on a site
  - Explore Google's privacy policy: What do they know about you?
- ● Information Literacy
  - ○ What is information literacy?
  - ○ How can you do effective internet searches?
  - ○ What are some techniques for judging source legitimacy and identifying misinformation?
  - ○ Example activities:
    - Create and test search queries
    - Explore evidence for using sources
- ● Creative Credit and Copyright
  - ○ What is copyright?
  - ○ What are the different types of copyright licenses
  - ○ Example activities:
    - Create citations for sources
    - Explore image search tools
- ● Hacking Ethics
  - ○ What are hackers?
  - ○ Are there different kinds of hackers? (white, black, grey)
  - ○ What are bug bounty programs?
  - ○ Is hacking always illegal?
  - ○ What are the consequences of illegal hacking?
  - ○ Example activities:
    - Explore what penetration testing is
    - Sign ethical hacker agreement
- ● Final project: Create a Public Service Announcement
  - ○ Create a Public Service Announcement (PSA) to teach your peers about your selected topic in digital citizenship and cyber hygiene. You can select any of the topics covered in this module. Be creative and make it fun! You could make a video, song, poster, or slideshow.

Module 3: Intro to Programming with Turtle Graphics (5-6 weeks/25-30 hours)

Browse the full content of this unit at https://codehs.com/library/course/6228/module/8860

Objectives / Topics Covered	● What is a Command? ● Moving Tracy ● Tracy's Coordinate System ● For Loops ● Functions and Parameters ● Top Down Design ● Variables ● User Input ● If/else Statements ● While Loops

Example Assignments / Labs	● 34 exercises total
	● Example exercises:
	  ○ Row of Circles
	    ■ In this program, Tracy should draw a row of circles across the

	width of the canvas using a for loop.
	○ Circle Pyramid
	■ Write a program that directs Tracy to draw a pyramid with 3 circles on the bottom row, 2 in the middle, and 1 on top.
	○ Bubble Wrap 2.0
	■ In this program, you should have Tracy add highlights to each bubble from our Bubble Wrap example program. Use top down design to break this large problem into smaller pieces!
	○ Rating
	■ Write a program that shows a graphical representation of a user's rating value. If the value is between 1 and 4, draw a red X. If it is between 5 and 7, draw a yellow horizontal line. If it is an 8 or above, draw a green checkmark.

Module 4: Web Design (4-6 weeks/20-30 hours)

In this module, you'll be introduced to the basics of HTML and CSS and will be able to create your own web pages!

Browse the full content of this unit at https://codehs.com/library/course/6228/module/8861

Objectives / Topics Covered	● How do we build web pages? ● Markup Languages ● HTML ● HTML tags ● HTML attributes ● HTML elements ● The Anatomy of an HTML page ● Formatting text ● Hyperlinks ● Images ● Copyright fair use ● Lists ● Nesting tags ● Tables ● Styling with HTML ● HTML Colors ● How do we style web pages? ● CSS vs HTML ● CSS Selectors ● Selecting by tag ● Selecting by class ● Selecting by id ● The Cascade (order of selector precedence)

Assignments / Labs	● Students create several web pages to practice each of the concepts above
	● Example exercises:
	    ○ Modify existing web pages using formatting tags to make text more readable
	    ○ Use links to create a web page linking to your 5 favorite websites
	    ○ Use links and images to create a personal library web page showing your favorite books
	    ○ Use lists and images to create a flashy list article
	    ○ Use tables to create a personal calendar web page

	○ Use styling attributes to add style to your web pages
	● Students create several web pages to practice applying CSS concepts
	● Example exercises:
	○ Use CSS selectors to style your previous web pages
	○ Use CSS selectors to style new web pages
	○ Create a music library web page and use CSS to style each song in your table
	○ Use CSS styling to make several images fit together properly
	○ Explain the benefits CSS provides over styling with only HTML
	○ Identify CSS selectors and rules used on example web pages

Module 5: Networking Fundamentals (3-4 weeks/15-20 hours)

This module explores 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. We will learn how the Internet connects computers all over the world. Finally, we will explore basic networking protocols, practical networking, and how networks are secured.

Browse the full content of this module at https://codehs.com/library/course/6228/module/8859

Objectives / Topics Covered	● Introduction to the Internet ● Internet Hardware ● Internet Addresses ● Domain Name System (DNS) ● Routing ● Packets and Protocols ● The Internet and Cybersecurity ● Impact of the Internet ● Network Hacks ● Securing a Network

Example Assignments / Labs	● Introduction to the internet
	   ○ What is the Internet? How does it work? What have been its impact on society?
	   ○ Why do we need protocols for the Internet?
	   ○ Example Activity
	      ■ Explore the different levels of the internet.
	● Internet hardware
	   ○ Vocabulary: bandwidth, bitrate, latency
	   ○ Why are protocols so important?
	   ○ How do we send data over the Internet?
	   ○ Example Activities
	      ■ Explore how data is able to be transmitted across the ocean by using underwater cables
	      ■ Explore the role of simple and complex networks and routers
	● Internet Addresses
	   ○ Vocabulary: Internet Protocol (IP)
	   ○ How do IP addresses compare to postal addresses?
	   ○ How IP addresses work?
	   ○ Example Activities
	      ■ Explore the differences between IPv4 and IPv6. Why are we running out of addresses?

	■ Trace a website request from the server, through the network, and to your computer - Domain Name System (DNS) - How does DNS help with sending digital information and IP addresses? - Example Activities - Explore the process of how requesting a web resource works - Routing - How is routing used to send messages / data? - Why is redundancy a good thing for the Internet? (fault tolerant) - Packets and Protocols - How data is transmitted? - How are internet packets able to find their way to your computer? - Example Activities: - Explain in your own words how a request from your computer travels through the various levels of servers to reach and return the correct webpage and resources? - As a class, create a protocol that will allow one classmate to send another classmate a note, without the need for talking to each other. - What are the standard protocols for the Internet and how do they work? (TCP/IP, HTTP) - The Internet and Cybersecurity - What are cybercrime and cyberwarfare? - How do we network attacks? (certificate authorities, public key encryption) - Network Hacks - What are common network attacks? - Explain common network attacks and how they happen. (DNS spoofing, DoS/DDoS, Waterhole attacks, fake WAP, eavesdropping) - Securing a Network - How can we detect intrusions? (checking logs, firewall rules, intrusion detection systems - IDS) - What are some recommended approaches for mitigating or preventing network attacks? - Final Project - Create a basic network configuration simulation that is optimized for security via the following site: http://malkiah.github.io/NetworkSimulator/simulator01.html# - Final course Project / Challenge: - Walk through a simulated attack from the attacker and defender perspectives and incorporate all techniques and recommendations garnered from the course.

Module 6: Final Project (1-2 weeks, 5-10 hours)
This unit introduces students to the theory and practice of user interface design. Students learn about what makes an engaging and accessible user interface, and will employ an iterative design process including rapid prototyping and user testing to design and develop their own final project.
Browse the full content of this unit at https://codehs.com/library/course/6228/module/8862

Objectives / Topics Covered	● Prototyping ● Testing ● Project Planning ● Final Project Creation
Assignments / Labs	● Collaborative open-ended final project which encourages creativity ● Requirements The list below lays out the minimum requirements of your website. Feel free to go big and add even more! Your website: ■ must detail the community issue you are addressing ■ must include at least 3 pages covering the following: ● general information, including contact information and a link to the chosen organization's website ● background of the issue, including an interactive data visualization showing an important statistic ● how the chosen organization is working to find a solution and why they should be sponsored by NuWorld ■ must include a new logo that morphs NuWorld's logo with that of the chosen organization (NuWorld's logo will be provided in a future lesson). This new logo can either be in a static image format or a gif.

Optional Supplemental Materials (Remainder of school year)

Supplementary Units	Prerequisite/Recommended Unit(s)	# of activities
Advanced Tracy Challenges	Introduction to Programming with Turtle Graphics	4
Building Mathematical Models	Introduction to Programming with Turtle Graphics. Students should also have completed Algebra I or higher.	4
Advanced HTML & CSS	Web Design	47