



CodeHS

Tennessee Computer Science Foundations Syllabus 1 year for High School (145-155 contact hours)

Course Overview and Goals

The Tennessee Computer Science Foundations course is intended to teach students the fundamentals of computer science in a project-based learning environment. The full course is designed to cover the core requirements and all four focus areas, however specific modules can be removed if a particular focus area is not needed for the class.

Students will learn the basics of computer technology, including computer hardware, software, the Internet, and cloud computing. They will then have the options to choose from the 4 focus areas, including web design, coding, networking, and cybersecurity.

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. Several units end with a comprehensive unit test that assesses students' mastery of the material from that unit as well as challenge problems where students can display their understanding of the material.

Development Environment: Students write and run HTML, CSS, and JavaScript files in the browser using the CodeHS editor. Due to the fact that different browsers treat HTML and CSS differently, we highly recommend that all student computers use an up-to-date version of the Chrome browser. You can download an up-to-date version of Chrome for free here: <https://www.google.com/chrome/browser/>

More information: Browse the content of this course at <https://codehs.com/course/8902>

Prerequisites: There are no prerequisites for the Tennessee Computer Science Foundations course.

Course Breakdown

Unit 1: Programming with Karel - OPTIONAL: Coding Focus (3 weeks / 15 hours)

Students learn the basics of programming by giving Karel the Dog commands in a grid world.

Objectives / Topics Covered	<ul style="list-style-type: none">● Commands● Defining vs. calling methods● Designing methods● Program entry points● Control flow● Looping● Conditionals● Classes
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	<ul style="list-style-type: none"> ● Commenting code ● Preconditions and Postconditions ● Top-down design
Assignments / Labs	<ul style="list-style-type: none"> ● Program-specific tasks for Karel the Dog <ul style="list-style-type: none"> ○ Example exercise: Pyramid of Karel ● Teach Karel new commands like <code>turnRight()</code> or <code>makePancakes()</code> <ul style="list-style-type: none"> ○ Example Exercise: Pancakes ● Solve large Karel problems by breaking them down into smaller, more manageable problems using Top Down Design <ul style="list-style-type: none"> ○ Example Exercise: The Two Towers ● Using control structures and conditionals to solve general problems <ul style="list-style-type: none"> ○ Example Exercise: Random Hurdles

Unit 2: What is Computing? (4 weeks / 20 hours)

Students dive into the history of computing, consider how computing impacts today's world, and learn about the various parts that make up modern computers.

Objectives / Topics Covered	<ul style="list-style-type: none"> ● History of computers ● What is a computer? ● What is software? ● What is hardware? ● History of operating systems ● Future of computing
Assignments / Labs	<ul style="list-style-type: none"> ● History <ul style="list-style-type: none"> ○ Find out when the first computers were created ○ Research famous computer innovators ○ What roles do computers play in your life? ○ Example Activity: <ul style="list-style-type: none"> ■ Summarize an era of advances in computers ● What is a computer? <ul style="list-style-type: none"> ○ What parts do modern computers have? ○ What are input devices? ○ What are output devices? ○ Example Activity: <ul style="list-style-type: none"> ■ Draw a computer and label all of its parts ● Software/Hardware <ul style="list-style-type: none"> ○ What's the difference? ○ What hardware components make up a computer? ○ What is software used for? ○ Example Activity: <ul style="list-style-type: none"> ■ Label the parts of your computer ● Future of computing <ul style="list-style-type: none"> ○ Research uses of Artificial Intelligence in use now ○ Research new ways of storing data ○ Example class activity: <ul style="list-style-type: none"> ■ In what ways can we use technology that we couldn't 10 years ago. Are these technological advances helpful or harmful overall?

Unit 3: Electrical Circuits (2 weeks / 10 hours)

Students learn the basics of electrical circuits and electrical principles such as Ohms law. Students explore these concepts using an online circuit simulator.

Objectives / Topics Covered	<ul style="list-style-type: none">● Understand basic lab and electrical safety● Create basic electrical circuits● Understand, calculate, and see Ohm's law in action● Calculate energy and power of an electrical circuit● Use logical gates to model real-life scenarios
Assignments / Labs	<ul style="list-style-type: none">● Example exercises:<ul style="list-style-type: none">○ Basic lab safety○ Exploring the multimeter○ Exploring Ohm's Law○ Calculating Ohm's Law○ Logical AND and OR chips exploration

Unit 4: Web Design - OPTIONAL: Web Design Focus (4 weeks / 20 hours)

Students learn the basics of HTML, CSS, and the processes involved in viewing web pages on the internet. Students create several simple web pages using the CodeHS online editor to gain practice!

Objectives / Topics Covered	<ul style="list-style-type: none">● 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
Assignments / Labs	<ul style="list-style-type: none">● Students create several web pages to practice each of the concepts above● Example exercises:<ul style="list-style-type: none">○ 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 styling attributes to add style to your web pages● Students create a keyboard short cut table in a project-based assignment

Unit 5: Project - Create a Website - OPTIONAL: Web Design Focus (3 weeks / 15 hours)

Students build their own websites about themselves. This site will be accessible on their own custom domain and will be continually improved by the student as they continue on in the course. It will serve as a running portfolio of each creative project they create in the course.

Objectives / Topics Covered	<ul style="list-style-type: none">● The use of software development teams● Unising planning to create a website● Developing a website based on customer input● Building a website using teamwork
Example Assignments / Labs	<ul style="list-style-type: none">● Brainstorming project ideas<ul style="list-style-type: none">○ Using a mind map to come up with ideas○ Creating and executing a customer survey● Planning a website development<ul style="list-style-type: none">○ Creating a site map○ Creating a project timeline● Building a website to feature an Innovation

Unit 6: Digital Information - OPTIONAL: Networking Focus (3 weeks / 15 hours)

Students learn about the various ways to represent information digitally including number systems, encoding data, programmatically creating pixel images, comparing data encodings, compressing, and encrypting data.

Objectives / Topics Covered	<ul style="list-style-type: none">● Understand how data is stored in computers● Translate numbers between multiple number systems● Troubleshooting computer issues
Assignments / Labs	<ul style="list-style-type: none">● Intro to digital information● Number systems<ul style="list-style-type: none">○ Binary○ Hexidecimal● Data compression<ul style="list-style-type: none">○ Lossy compression○ Lossless compression● Research the different steps of the troubleshooting process

Unit 7: The Internet (2 weeks / 10 hours)

Students explore the structure and design of the internet, and how this design affects the reliability of network communication, the security of data, and personal privacy.

Objectives / Topics Covered	<ul style="list-style-type: none">● Understand how the Internet works● Research different jobs in the Internet field● Explain the impacts of copyright laws and how the Internet impacts these● Introduction to cybersecurity
Assignments / Labs	<ul style="list-style-type: none">● Internet hardware● IPv4 vs IPv6● How does DNS work?● Route tracing● Sequential, parallel & distributed computing

	<ul style="list-style-type: none"> ● The Impact of the Internet ● Careers and ethics in the Internet age
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Unit 8: Cloud Computing (2 weeks / 10 hours)

Students explore the past, present, and future of Cloud computing in this module through a variety of exploration exercises.

Objectives / Topics Covered	<ul style="list-style-type: none"> ● What is cloud computing ● History of cloud computing ● Cloud vs physical computing ● The Internet of things
Example Assignments / Labs	<ul style="list-style-type: none"> ● Cloud computing case study ● Project: History of cloud computing ● Researching cloud computing deployment models ● Smart devices in your life

Unit 9: What is Cybersecurity? - OPTIONAL: Cyber Focus (2 weeks / 10 hours)

Students explore the basics of cybersecurity. Students learn about why cybersecurity is important, recent threats to cybersecurity, and different careers in the field.

Objectives / Topics Covered	<ul style="list-style-type: none"> ● Course overview ● What is cybersecurity? ● Impact of cybersecurity ● The CIA triad
Assignments / Labs	<ul style="list-style-type: none"> ● Overview <ul style="list-style-type: none"> ○ Lists steps to take to protect yourself on the Internet ○ What is something you want to know or make by the end of the course? ● What is cybersecurity? <ul style="list-style-type: none"> ○ Summarize and discuss recent cyber attacks ○ Explore a threat map to see where cyber attacks are coming from and which countries are being targeted ● Impact of cybersecurity <ul style="list-style-type: none"> ○ Review resources and reflect on or discuss <ul style="list-style-type: none"> ■ What information do cyber criminals steal? ■ What do cyber criminals do with stolen information? ● The CIA Triad <ul style="list-style-type: none"> ○ What is the CIA triad? (confidentiality, integrity, availability) ○ What are “secure systems?” ○ What do confidentiality, integrity, and availability mean in cybersecurity? ○ Example activities: ○ Determine where scenarios break part of the CIA Triad

Unit 10: Project - Data (2 weeks / 10 hours)

Students explore using computational tools to store massive amounts of data, manipulate and visualize data, find patterns in data, and pull conclusions from data.

Objectives / Topics Covered	<ul style="list-style-type: none">● Visualizing and Interpreting data● Collecting data and data limitations
Assignments / Labs	<ul style="list-style-type: none">● Getting started with data● Visualizing and interpreting data● Data collection and limitations

Unit 11: Advanced Coding Concepts - OPTIONAL: Coding Focus (2 weeks / 10 hours)

Students explore various computer programming advanced concepts such as file management, command line prompts, and shell scripts.

Objectives / Topics Covered	<ul style="list-style-type: none">● Creating websites with multiple files● Command line interface● Automating command prompts with shell scripts● Parts of the software development lifecycle
Assignments / Labs	<ul style="list-style-type: none">● File management for website<ul style="list-style-type: none">○ Using multiple files○ Using multiple folders● Network management<ul style="list-style-type: none">○ SSH logs○ Mac and Windows command prompt simulators● System commands<ul style="list-style-type: none">○ cd, ls, mk etc● Shell scripts<ul style="list-style-type: none">○ Basic commands○ Executing programming scripts● Software development lifecycle<ul style="list-style-type: none">○ Parts of the development lifecycle○ Using GitHub