



CodeHS

Utah Exploring Computer Science Syllabus 1 semester for High School (75 contact hours)

Course Overview and Goals

Utah Exploring Computer Science is designed to introduce students to the breadth of the field of computer science through an exploration of engaging and accessible topics. The course focuses on the conceptual ideas of computing and helps students understand why certain tools or languages might be utilized to solve particular problems.

The goal of Exploring Computer Science is to develop in students the computational thinking practices of algorithm development, problem solving, and programming within the context of problems that are relevant to the lives of today's students. Students will also be introduced to topics such as artificial intelligence, web development, programming, and physical computing.

Learning Environment

The course utilizes a blended classroom approach. The content is provided through a mix of web-based and physical exercises, with students writing and running code in the browser and using their physical devices for testing and exploration. 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 contain a variety of activities, from video tutorials, example programs to explore, interactive web pages, and hands-on programming exercises.

Programming Environment

Students write and run JavaScript and HTML programs in the browser using the CodeHS editor. They also write and run programs in the browser using the MakeCode editor and download their programs to their micro:bit devices for further testing.

Prerequisites

There are no prerequisites for this course, though prior exposure to the basics of programming would always help. This course is meant to be a first-time introduction to computer science and does not require students to come in with any computer programming experience.

More Information

Browse the course content: <https://codehs.com/course/21435>

Course Breakdown

Module 1: Exploring Code with Karel (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● Functions● Conditionals● Looping● Control Flow● Algorithms
Example Assignments / Labs	<ul style="list-style-type: none">● Program-specific tasks for Karel the Dog<ul style="list-style-type: none">○ Example Exercise: Tennis Ball Game Setup Karel's getting ready to play a tennis ball game with friends at the dog park. Karel wants to hide 4 tennis balls around the dog park. Help Karel get the game setup by programming Karel to put one tennis ball on each of the purple squares around the dog park.● Teach Karel new commands like <code>turnRight()</code> or <code>makeStack()</code><ul style="list-style-type: none">○ Example Exercise: Tennis Ball Stacks Karel is setting up stacks of tennis balls for a game with friends. The stacks of tennis balls need to be placed on the cement squares in the 2nd, 4th, and 6th columns. Each stack should have three tennis balls. Create a function called <code>makeStack()</code> to help Karel create the tennis ball stacks.● Using control structures and conditionals to solve general problems<ul style="list-style-type: none">○ Example Exercise: Karel's Race Your task is to get Karel to move around the racetrack eight times, and end up back in the starting position. Every time Karel hits a corner, Karel should put a ball down. Then at the end of the race there should be 8 balls on each corner.

Module 2: Computing Ideas (1-2 weeks / 5-7 hours)

Students learn about what makes a computer a computer as well as the various ways we represent information digitally.

Objectives / Topics Covered	<ul style="list-style-type: none">● Hardware● Software● Digital Information
Example Assignments / Labs	<ul style="list-style-type: none">● Personalized Peripherals<ul style="list-style-type: none">○ Students research and find relevant peripheral devices for each of the given scenarios.● Operating System Scavenger Hunt<ul style="list-style-type: none">○ Students embark on an operating system scavenger hunt to explore and uncover various functions and features.● Write a Message in Binary

	<ul style="list-style-type: none"> ○ Students create their own encoding schema to write a message in binary, then learn about and use the ASCII encoding system
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Module 3: Intro to micro:bit (3-4 weeks / 15-20 hours)

Students learn the basics of the micro:bit, such as how to light up and change the brightness of LEDs and how to use variables to write more versatile programs.

Objectives / Topics Covered	<ul style="list-style-type: none"> ● Intro to physical computing ● Goal setting ● Comments ● Pseudocode ● Analog vs. digital ● Variables ● Connecting external components ● For and while Loops ● Explore a new sensor
Example Assignments / Labs	<ul style="list-style-type: none"> ● Blinking Diamond <ul style="list-style-type: none"> ○ Blink LEDs between a large diamond shape and small diamond shape every half a second as long as the program is running ● Moving Bright Box <ul style="list-style-type: none"> ○ Light the corners on the grid with the highest brightness for half a second. Light the corners of the inner box with a brightness of 150 for half a second. Light the middle LED with a brightness of 50 for half a second. Repeat until the program is manually ended. ● Opposite Blinking External LEDs <ul style="list-style-type: none"> ○ Blink two external LEDs opposite one another. One LED should be lit while the other is off. After 1 second, the lit LED should turn off and the unlit LED should turn on. After 1 second, they should switch again. This should continue until the program is manually ended ● Twinkle Twinkle <ul style="list-style-type: none"> ○ Control your micro:bit to play Twinkle Twinkle Little Star! Use loops (maybe more than one!) to play the song until the program is manually stopped. ● Explore a new sensor <ul style="list-style-type: none"> ○ Research a sensor we have not studied in this course and explore how it is used. In a group, develop and present a lesson to teach your peers about your chosen sensor, including exercises where they can practice using the sensor for themselves.

Module 4: Cybersecurity and You (1-2 weeks / 6-8 hours)

Students delve into key areas such as personal data collection and security, cyber ethics and laws, and cybersecurity essentials, equipping individuals with the knowledge to navigate the digital landscape responsibly and securely.

Objectives / Topics Covered	<ul style="list-style-type: none"> ● Digital Footprint and Responsibility ● Personal Data Collection and Security ● Cyber Ethics and Laws
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	<ul style="list-style-type: none"> ● Cybersecurity Essentials ● Common Cyber Attacks and Prevention
Example Assignments / Labs	<ul style="list-style-type: none"> ● Digital Footprint and Responsibility <ul style="list-style-type: none"> ○ 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 <ul style="list-style-type: none"> ○ 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 <ul style="list-style-type: none"> ○ 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 <ul style="list-style-type: none"> ○ 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 5: Exploring Web Design (3 weeks / 15 hours)

Students learn the basics of HTML and CSS as they create their own websites.

Objectives / Topics Covered	<ul style="list-style-type: none"> ● HTML ● HTML tags, attributes, and elements ● Formatting text ● Hyperlinks ● Images ● Lists ● Intro to CSS styling ● Multi-page websites ● Designing webpages ● Careers in development
Example Assignments / Labs	<ul style="list-style-type: none"> ● Create Your Own Homepage <ul style="list-style-type: none"> ○ Students will build their own website about themselves. This site will be accessible on their own custom url on the CodeHS site, 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. ● Wireframe a Webpage <ul style="list-style-type: none"> ○ Students learn about webpage layouts and wireframing as a design technique. They begin to look critically at existing pages, creating wireframes for them, before designing the layout of their own homepage.

	<ul style="list-style-type: none"> ● Careers in Development <ul style="list-style-type: none"> ○ Students reflect on their own interests and qualities before learning about possible career paths in software and web development.
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Module 6: The World of Artificial Intelligence (1-2 weeks / 5-7 hours)

Students learn the basics of what Artificial Intelligence is and dig into different aspects of AI, including machine learning algorithms and ethical practices.

Objectives / Topics Covered	<ul style="list-style-type: none"> ● Introduction to Artificial Intelligence ● Machine Learning ● Neural Networks ● The Ethics of Artificial Intelligence ● The impact of Artificial Intelligence
Example Assignments / Labs	<ul style="list-style-type: none"> ● Generative AI: Write a Poem <ul style="list-style-type: none"> ○ Students explore different types of AIs ● Supervised Teachable Machine <ul style="list-style-type: none"> ○ Students explore Google's Teachable Machine to create a basic AI ● Neural Network Parameters <ul style="list-style-type: none"> ○ Using a sandbox environment, students explore the impacts of various parameters

Optional Supplemental Materials

Program Control with micro:bit (2-3 weeks/10 hours)

Students combine control structures, such as if/else statements and loops, with the micro:bit built-in and external sensors to write programs that react to the outside world.

Objectives / Topics Covered	<ul style="list-style-type: none"> ● If statements ● If/else statements ● Using buttons ● Using servo motors ● Operators (arithmetic, comparison, and logical) ● Using sensors (light, temperature, acceleration, distance) ● Functions and parameters
Example Assignments / Labs	<ul style="list-style-type: none"> ● Servo Position by Button Press <ul style="list-style-type: none"> ○ Increase the servo position by 90 degrees each time Button A is pressed. Decrease the servo position by 90 degrees each time Button B is pressed. Repeat this motion until the program is manually ended. ● Temperature Monitor <ul style="list-style-type: none"> ○ Create a temperature monitor. If the temperature is between 60 and 70 degrees fahrenheit, the middle LED should stay on. If the temperature is below 60 or above 70 degrees fahrenheit, the middle LED should blink on and off at a speed of a quarter second. Repeat this motion until the program is manually ended.

	<ul style="list-style-type: none"> ● LED Arrow Following Servo <ul style="list-style-type: none"> ○ When button A is pressed, increase the servo position by 90 degrees. When button B is pressed, decrease the servo position by 90 degrees. Use functions to light an LED arrow on the screen that points in the direction of the servo (up, down, left, or right).
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Advanced micro:bit (4-6 weeks/20-30 hours)

Students explore all of the capabilities of the micro:bit on their own as they research, explore, and teach their peers about new sensors.

Objectives / Topics Covered	<ul style="list-style-type: none"> ● Challenges ● Build a step-by-step project ● Final project
Example Assignments / Labs	<ul style="list-style-type: none"> ● Build a step-by-step project <ul style="list-style-type: none"> ○ Find a ready-made project online. Follow the steps to recreate the project using your micro:bit and any needed materials. ○ Create an updated set of directions complete with pictures and tips from your experience. ● Final project <ul style="list-style-type: none"> ○ Use your micro:bit to bring an idea to life using sensors and external components. ○ Present your project to peers, administration, and family!