

# North Carolina Introduction to Computer Science Syllabus

High School (150 Contact Hours)

## Course Overview and Goals

In the North Carolina Introduction to Computer Science course, students will gain foundational knowledge in computer science, covering a wide range of topics from cyber security to artificial intelligence. The course will also introduce students to programming, starting with basic concepts using Karel the dog and progressing to more advanced JavaScript techniques, including functions, control structures, and algorithms. Additionally, they will develop a strong understanding of digital responsibility, learning about topics like personal data security, digital footprints, and the ethical challenges posed by technology. By the end of the course, students will be equipped with the technical skills and ethical awareness to engage with technology in a responsible and impactful way.

## Learning Environment

The course utilizes a blended classroom approach. The content is a mix of web-based and physical activities. Each module of the course is broken down into lessons. Lessons are composed of short video tutorials, interactive learning pages, quizzes, explorations, simulations, and free-response prompts. Each module ends with a comprehensive quiz that assesses students' mastery of that module's material.

## More Information

Browse the content of this course at <https://codehs.com/course/25384/overview>

## Technology Requirements

To complete all activities and exercises in this course, students must have access to the 3rd party sites and tools listed here: [North Carolina Introduction to Computer Science Course Links](#).

## Prerequisites

The North Carolina Introduction to Computer Science 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/25384/explore/module/35185>

Topics Covered	<ul style="list-style-type: none"> <li>● Digital Footprint and Responsibility</li> <li>● Personal Data Collection and Security</li> <li>● Cyber Ethics and Laws</li> <li>● Cybersecurity Essentials</li> <li>● Common Cyber Attacks and Prevention</li> </ul>
Example Assignments	<ul style="list-style-type: none"> <li>● Digital Footprint and Responsibility <ul style="list-style-type: none"> <li>○ 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.</li> </ul> </li> <li>● Personal Data Collection and Security <ul style="list-style-type: none"> <li>○ This lesson delves into the use and security of personal data, discussing how companies like Google utilize user information, the implications of location tracking, and 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.</li> </ul> </li> <li>● Cyber Ethics and Laws <ul style="list-style-type: none"> <li>○ 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.</li> </ul> </li> </ul>

## Module 2: IT Concepts (4 weeks/20 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 unit at <https://codehs.com/course/25384/explore/module/35188>

Topics Covered	<ul style="list-style-type: none"> <li>● Encoding Text and Images in Binary</li> <li>● IP Addresses</li> <li>● Routing and Packets</li> <li>● Protocols: TCP, UDP, HTTP/HTTPS</li> <li>● How do Websites Work?</li> <li>● OSI Model</li> <li>● Impact of the Internet</li> </ul>
Example Assignments	<ul style="list-style-type: none"> <li>● Encoding Text in Binary <ul style="list-style-type: none"> <li>○ <i>Write a Message in Binary:</i> In this activity, students will use ASCII encoding to write the same message in binary. Then, they will trade messages with a partner and use ASCII encoding to figure out their partner's message.</li> </ul> </li> <li>● OSI Model <ul style="list-style-type: none"> <li>○ <i>Troubleshooting with the OSI Model:</i> Students have been hired as a</li> </ul> </li> </ul>

	<p>network engineer for Tea-Riffic Blends Co., a small business that sells specialty teas. They are in charge of setting up their network, configuring it, and solving any issues that arise. The OSI model can help with troubleshooting because it can isolate the layer causing the issue. Read through the following three scenarios. Based on the problem and what your students' know about the OSI layers, they need to identify which layer they should target to solve the issue. Then, explain their reasoning.</p> <ul style="list-style-type: none"> <li>● Impact of the Internet <ul style="list-style-type: none"> <li>○ <i>Compass Points: The Internet:</i> In this activity, students use the Compass Points thinking routine to examine their feelings about the Internet and its impact on society.</li> </ul> </li> </ul>
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### Module 3: Data and Spreadsheets (2 weeks/10 hours)

In this module, students will learn the basics of spreadsheet operations such as sorting, filtering, and applying formulas like average, median, and mode. They also learn how to create visualizations using the data in Google Sheets. They will create data dashboards, learn about data models, and complete the module with a data storytelling project.

Browse the full content of this unit at <https://codehs.com/course/25384/explore/module/35189>

Topics Covered	<ul style="list-style-type: none"> <li>● Data as a Resource</li> <li>● Using Databases</li> <li>● Introduction to Spreadsheets</li> <li>● Sort and Filter</li> <li>● Statistical Measures</li> <li>● Models</li> <li>● Visualizing Data</li> </ul>
Example Assignments	<ul style="list-style-type: none"> <li>● Sort and Filter <ul style="list-style-type: none"> <li>○ <i>Influential Women:</i> In this exercise, students will learn about remarkable women who have made significant contributions in fields like Science, Literature, and Environmentalism, while having the opportunity to sort and filter data to uncover interesting facts and connections about these inspiring figures.</li> </ul> </li> <li>● Statistical Measures <ul style="list-style-type: none"> <li>○ <i>Mammal Statistics:</i> In this exercise, students will explore data on common mammals while calculating the mean, median, and mode of various data points to derive meaningful insights.</li> </ul> </li> <li>● Visualizing Data <ul style="list-style-type: none"> <li>○ <i>Create a Dashboard:</i> In this exercise, students will explore running analytics data and create an engaging running dashboard, a powerful tool that consolidates essential information and data visualizations in one place.</li> </ul> </li> <li>● Project: Tell Your Story <ul style="list-style-type: none"> <li>○ <i>Draft a Design:</i> For this activity, students will take time to explore data storytelling designs and draft their own story. They can create</li> </ul> </li> </ul>

	their infographic directly in the spreadsheet or sketch their design on paper, in PowerPoint, or using a program of their choice.
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### Module 4: Exploring Computing (2 weeks/10 hours)

In this module, students will explore various technologies and their impact on our world. They will learn about the history of computers, various types of software, cloud computing, and key computer components. They will also discuss the ethical and legal considerations in technology that can lead to bias.

Browse the full content of this unit at <https://codehs.com/course/25384/explore/module/35187>

Topics Covered	<ul style="list-style-type: none"> <li>● History of Computing</li> <li>● Software</li> <li>● Hardware</li> <li>● Operating Systems</li> <li>● Cloud Computing</li> <li>● Ethics and Legal Considerations</li> <li>● The Future of Computing</li> </ul>
Example Assignments	<ul style="list-style-type: none"> <li>● History of Computing <ul style="list-style-type: none"> <li>○ <i>Jigsaw: Computer Interaction Over the Decades:</i> In this activity, students are going to work in small groups to research what it was like to interact with computers over the various decades. For each section, students will want to consider what was typical for most computers. For example, GUI interfaces were first used in the 1970s, but they were not typical until the 1980s.</li> </ul> </li> <li>● Cloud Computing <ul style="list-style-type: none"> <li>○ <i>Case Study: Cloud Computing vs. Physical Computing:</i> Is cloud computing more efficient? Is physical computing the way to go? Students will read through a case study for a middle school that needs to decide between implementing a cloud computing solution or a physical computing solution. What are the pros and cons of each? Which way would you ultimately choose to implement?</li> </ul> </li> <li>● Hardware <ul style="list-style-type: none"> <li>○ <i>Brainstorm: New Computer Components:</i> In this activity, students are going to work with a partner to brainstorm 3 new components for a computer. It can be an entirely new idea or an improvement of an existing component. For each idea, answer the following questions: What is it? Does it replace something, or is it an additional item? If it replaces something, what is it replacing? How will this be helpful in the future?</li> </ul> </li> </ul>

### Module 5: Programming with Karel (4 weeks/20 hours)

In this module, students will use Karel, a dog that can move, turn left, and place tennis balls, to explore the fundamentals of programming and enhance their computational problem-solving skills. They will discover the importance of programming languages and their applications, learn to write programs to tackle computational

challenges, design algorithms, and analyze various potential solutions. Additionally, students will learn the value of collaboration and the challenges it presents when working together to solve programming problems.

Browse the full content of this unit at <https://codehs.com/course/25384/explore/module/35186>

<p>Topics Covered</p>	<ul style="list-style-type: none"> <li>● Commands</li> <li>● Defining vs. Calling Functions</li> <li>● Designing Functions</li> <li>● Variables</li> <li>● Program Entry Points</li> <li>● Control Flow</li> <li>● Looping</li> <li>● Conditionals</li> <li>● Commenting Code</li> <li>● Preconditions and Postconditions</li> <li>● Top Down Design</li> </ul>
<p>Example Assignments</p>	<ul style="list-style-type: none"> <li>● More Basic Karel             <ul style="list-style-type: none"> <li>○ <i>Pyramid of Karel</i>: Write a program to have Karel build a pyramid. There should be three balls on the first row, two in the second row, and one in the third row.</li> </ul> </li> <li>● Functions in Karel             <ul style="list-style-type: none"> <li>○ <i>Pancakes</i>: Karel is the waiter and needs to deliver a stack of pancakes to the guests on the 2nd, 4th, and 6th columns. Each stack of pancakes should have three pancakes. Create a function called <i>makePancakes()</i> to help Karel solve this problem. The world should end up exactly as shown here.</li> </ul> </li> <li>● Top Down Design and Decomposition in Karel             <ul style="list-style-type: none"> <li>○ <i>The Two Towers</i>: In this program, Karel should build two towers of tennis balls. Each tower should be 3 tennis balls high. At the end, Karel should end up on top of the second tower, facing East.</li> </ul> </li> <li>● Control Structures Example             <ul style="list-style-type: none"> <li>○ <i>Random Hurdles</i>: Write a program that has Karel run to the other side of the first row, jumping over all of the hurdles. Karel should only jump if there is a hurdle blocking the way. However, the hurdles can be in random locations. The world is fourteen columns long. Students must write a function named <i>jumpHurdle()</i> as part of their solution.</li> </ul> </li> </ul>

### Module 6: Karel Challenges (2 weeks/10 hours)

In this module, students will learn the value of collaboration and the challenges it presents when working together to solve programming problems. They will also develop essential teamwork skills and enhance their coding communication skills.

Browse the full content of this unit at <https://codehs.com/course/25384/explore/module/35198>

Topics Covered	<ul style="list-style-type: none"> <li>● Solution Planning</li> <li>● Crafting Solutions</li> <li>● Decomposition</li> <li>● Function Utilization</li> <li>● Control Structures</li> <li>● Code Readability</li> <li>● Conditions</li> <li>● Commenting</li> <li>● Top-Down Design</li> </ul>
Example Assignments	<ul style="list-style-type: none"> <li>● Karel Challenges <ul style="list-style-type: none"> <li>○ <i>Fetch</i>: There is a ball up on a shelf. Karel starts off on the floor and needs to go up to the shelf to fetch the ball and bring it back to the start.</li> <li>○ <i>Racing Karel</i>: Karel's world is a racetrack and Karel is going to run a race. Write a program to get Karel to move around the racetrack eight times, and end up back at the starting location. Every time Karel hits a corner, put a ball down, so at the end, there are 8 balls on each corner.</li> <li>○ <i>Tower Builder</i>: Karel starts on the first row and first column. Your job is to build a tower (a stack of 3 tennis balls) on all of the odd columns in the world. i.e. 1st, 3rd, 5th, 7th, etc. This must work on any sized world, so there could only be 1 column or there could be 100 columns, and it should still build a tower on every odd column.</li> </ul> </li> </ul>

### Module 7: JavaScript Basics (2 weeks/5-10 hours)

In this module, students will learn the basics of JavaScript including variables, user input, mathematics, and functions.

Browse the full content of this unit at <https://codehs.com/course/25384/explore/module/35213>

Objectives / Topics Covered	<ul style="list-style-type: none"> <li>● Variables</li> <li>● User Input</li> <li>● Arithmetic Expressions</li> <li>● Constants</li> <li>● Collaborative Programming</li> <li>● Random Numbers</li> <li>● Functions</li> </ul>
Assignments / Labs	<ul style="list-style-type: none"> <li>● Hello World <ul style="list-style-type: none"> <li>○ <i>Your Name and Hobbie</i>: Write a program that prints out your name on one line, and then on the next line says a hobby you have.</li> </ul> </li> <li>● User Input <ul style="list-style-type: none"> <li>○ <i>Dinner Plans</i>: 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!</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>● Basic Functions           <ul style="list-style-type: none"> <li>○ <i>Digital Business Card</i>: Define and call the function <code>printBusinessCard()</code>. When called, this function should print out your name, job title (you can make one up if you don't have one), email address, and a tagline!</li> </ul> </li> </ul>
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## Module 8: The Canvas and Graphics (1 week/5 hours)

In this module, students will learn how to add graphics objects and position them on the canvas.

Browse the full content of this unit at <https://codehs.com/course/25384/explore/module/35285>

Objectives / Topics Covered	<ul style="list-style-type: none"> <li>● JavaScript Canvas</li> <li>● JavaScript Graphics</li> <li>● Positioning Graphics Objects</li> </ul>
Assignments / Labs	<ul style="list-style-type: none"> <li>● Intro to the Canvas and Graphics           <ul style="list-style-type: none"> <li>○ <i>A Ball in a Box</i>: Your task is to draw a ball inside of a box! Make sure it is visible and not behind the box. Try changing the order of the function call statements and see what happens.</li> </ul> </li> <li>● More Graphics Objects           <ul style="list-style-type: none"> <li>○ <i>Create Your Own Meme</i>: In this exercise, you are going to create your own meme! The only requirements are that you add at least one image and one text element.</li> </ul> </li> <li>● Positioning Graphics Objects           <ul style="list-style-type: none"> <li>○ <i>Color the Rainbow</i>: Have you ever seen the acronym ROYGBIV before? Do you remember what it stands for? It's the order of the colors in the rainbow (red, orange, yellow, green, blue, indigo, violet). In this exercise, you need to create a vertical rainbow with the colors ROYGBIV that fills the entire canvas.</li> </ul> </li> </ul>

## Module 9: Control Structures (3 weeks/15 hours)

In this module, students will learn how to use control structures such as if/else statements and loops to make advanced programs in JavaScript.

Browse the full content of this unit at <https://codehs.com/course/25384/explore/module/35214>

Objectives / Topics Covered	<ul style="list-style-type: none"> <li>● Booleans</li> <li>● If/Else Statements</li> <li>● Logical Operators</li> <li>● Comparison Operators</li> <li>● Conditionals</li> <li>● While Loops</li> <li>● Break Statements</li> <li>● For Loops</li> <li>● Nested Control Structures</li> </ul>
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Assignments / Labs	<ul style="list-style-type: none"> <li>● Booleans <ul style="list-style-type: none"> <li>○ <i>Do You Have a Dog?:</i> Write a program that declares a Boolean variable stating whether or not you have a dog. Then, print out the value of that Boolean.</li> </ul> </li> <li>● While Loops <ul style="list-style-type: none"> <li>○ <i>Inventory:</i> 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.</li> </ul> </li> <li>● For Loops <ul style="list-style-type: none"> <li>○ <i>Jukebox:</i> In the days before the internet, many restaurants would have a jukebox that allowed customers to choose what music they wanted to play. Customers would enter a coin and choose from the jukebox's music collection by selecting a song's number. You could choose one song per coin. In this exercise, you will create a digital jukebox where the user can enter any number of quarters to create a playlist of songs.</li> </ul> </li> </ul>
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### Module 10: Control Structures Challenges (1 week/5 hours)

In this module, students will apply the foundational concepts from the Control Structures module to solve new challenges.

Browse the full content of this unit at <https://codehs.com/course/25384/explore/module/35215>

Objectives / Topics Covered	<ul style="list-style-type: none"> <li>● Solution Planning</li> <li>● Crafting Solutions</li> <li>● Control Structures</li> </ul>
Assignments / Labs	<ul style="list-style-type: none"> <li>● Control Structure Challenges <ul style="list-style-type: none"> <li>○ <i>Guessing Game:</i> The computer picks a number between 1 and 100, and you have to guess it. The computer will tell you whether your guess was too high, too low, or correct. Your assignment is to generate a random number and let the user guess numbers until they guess the correct number. Make sure to let the user know what they should do at the beginning of the program!</li> <li>○ <i>Landscape Generator:</i> In this challenge, you will make a landscape generator. If you think about it, creating a landscape requires a lot of repetition. If you want to make a forest, you have to draw a lot of trees. Or if you want to draw the night sky, you have to draw a lot of stars. Luckily, we can write computer programs that draw multiple objects at once!</li> </ul> </li> </ul>

### Module 11: Functions (2 weeks/10 hours)

In this module, students will learn to write reusable code with functions, parameters, and return values, and explore the impact of variable scopes.



Browse the full content of this unit at <https://codehs.com/course/25384/explore/module/35216>

Objectives / Topics Covered	<ul style="list-style-type: none"> <li>● Parameters</li> <li>● Return Values</li> <li>● Default Parameters</li> <li>● Scope</li> </ul>
Assignments / Labs	<ul style="list-style-type: none"> <li>● Parameters <ul style="list-style-type: none"> <li>○ <i>Cityscape</i>: Create a cityscape using functions and parameters! To do this, you need to write a function called <i>drawBuilding()</i> that draws a (rectangle) building. This function should take as parameters the width of the building, the height of the building, and the x-position of the building (remember where rectangles' positions are anchored!).</li> </ul> </li> <li>● Return Values <ul style="list-style-type: none"> <li>○ <i>Is it even?</i>: Write a program that continually asks the user for integers and then prints whether their input is even or odd. The user should keep entering numbers until they enter 0; at that point, print "Done!" on its own line.</li> </ul> </li> </ul>

## Module 12: Functions Challenges (1 week/5 hours)

In this module, students will apply what they learned in the Functions module to solve new challenges.

Browse the full content of this unit at <https://codehs.com/course/25384/explore/module/35217>

Objectives / Topics Covered	<ul style="list-style-type: none"> <li>● Solution Planning</li> <li>● Crafting Solutions</li> <li>● Functions</li> </ul>
Assignments / Labs	<ul style="list-style-type: none"> <li>● Functions Challenges <ul style="list-style-type: none"> <li>○ <i>Balloons</i>: You should use lines, circles, and random colors to draw a bunch of balloons. All the balloon strings should start two-thirds down the canvas. Each string line should travel upward to a random point and have a circle placed on top of the endpoint. Each balloon should be a random color and have a radius between MIN_RADIUS and MAX_RADIUS.</li> <li>○ <i>Ghost Invasion!</i>: Write a program to draw multiple ghosts on the screen after asking the user to input a maximum size factor for the ghosts and how many to draw. You must do this by writing a function called <i>drawGhost()</i>, which takes four parameters: the size factor of the ghost, the center x location of the ghost's circular head, the center y location of the ghost's circular head, and the color of the ghost.</li> </ul> </li> </ul>

### Module 13: Exploring AI/ML (2 weeks/10 hours)

In this module, students will gain an understanding of the main concepts and vocabulary around Artificial Intelligence (AI) and Machine Learning (ML). Additionally, students learn the fundamentals of machine learning, covering its lifecycle, supervised, unsupervised, and reinforcement learning, and explore bias within learning models.

Browse the full content of this unit at <https://codehs.com/course/25384/explore/module/35195>

Objectives / Topics Covered	<ul style="list-style-type: none"> <li>● Introduction to Artificial Intelligence</li> <li>● Generative vs Predictive AI</li> <li>● Large Language Models</li> <li>● Prompt Engineering</li> <li>● Introduction to Machine Learning</li> <li>● Supervised Learning</li> <li>● Unsupervised Learning</li> <li>● Reinforcement Learning</li> </ul>
Example Assignments	<ul style="list-style-type: none"> <li>● Generative vs Predictive: Explore Google Experiments <ul style="list-style-type: none"> <li>○ Students explore different applications of AI through Google Experiments.</li> </ul> </li> <li>● Large Language Models: Chatbot Arena <ul style="list-style-type: none"> <li>○ Students compare LLMs through the Chatbot Arena tool.</li> </ul> </li> <li>● Prompt Engineering: Generate an Image <ul style="list-style-type: none"> <li>○ Students use prompt engineering techniques to generate an image.</li> </ul> </li> <li>● Introduction to ML: CNN Visualization <ul style="list-style-type: none"> <li>○ Students observe how a CNN gathers data on an image and makes a prediction as to what it could represent.</li> </ul> </li> <li>● Supervised Learning: Apples vs Bananas <ul style="list-style-type: none"> <li>○ Students use Teachable Machine to build a model that categorizes apples and bananas.</li> </ul> </li> <li>● Unsupervised Learning: Bird Sounds <ul style="list-style-type: none"> <li>○ Students explore how an AI used unlabeled data to categorize bird sounds.</li> </ul> </li> <li>● Reinforcement Learning: Reinforcement Learning Game <ul style="list-style-type: none"> <li>○ Students engage with a visual depiction of reinforcement learning.</li> </ul> </li> </ul>
AI Tools/Permissions	<ul style="list-style-type: none"> <li>● <a href="#">Google Experiments</a></li> <li>● <a href="#">Chatbot Arena</a></li> <li>● <a href="#">ChatGPT/Gemini</a></li> <li>● <a href="#">Hugging Face</a></li> <li>● <a href="#">TensorFlow</a></li> <li>● <a href="#">adamharley.com</a></li> <li>● <a href="#">Google Teachable Machine</a></li> <li>● <a href="#">GitHub</a></li> </ul>

## Module 14: Training AI Models (1 week/5 hours)

In this hands-on module, students will learn how to train AI models using Teachable Machine and will explore the use cases for AI in various industries.

Browse the full content of this unit at <https://codehs.com/course/25384/explore/module/35197>

Objectives / Topics Covered	<ul style="list-style-type: none"><li>● How Are AI Models Trained?</li><li>● AI Models in Industry</li><li>● Bias in Training</li></ul>
Example Assignments	<ul style="list-style-type: none"><li>● How Are AI Models Trained: Turning on a Light<ul style="list-style-type: none"><li>○ Students train and use an AI model to control a program.</li></ul></li><li>● AI Models in Industry<ul style="list-style-type: none"><li>○ Students pick an industry to explore use cases of AI.</li></ul></li><li>● Bias in Training<ul style="list-style-type: none"><li>○ Students explore multiple ways bias creeps into AI programs through the use of bad training data.</li></ul></li></ul>
AI Tools/Permissions	<ul style="list-style-type: none"><li>● <a href="#">Google Teachable Machine</a></li><li>● <a href="#">Survival of the Best Fit</a></li></ul>