Course Outline: Coding with Python

This course is designed to offer an overview of computer science. In this self-paced course designed for high school students, academically advanced middle school students will learn programming along with the basics of computer science. The material emphasizes computational thinking and helps develop the ability to solve complex problems.

This course covers the basic building blocks of programming along with other central elements of computer science. It gives a foundation in the tools used in computer science and prepares students for further study in computer science, including AP Computer Science Principles and AP Computer Science A courses.

Prerequisites

No prior computer science knowledge or experience is necessary for this course.

Teaching Strategies

The primary language for the course is Python. The course will consist of video lectures, daily programming exercises, longer coding exercises, regular quizzes, and projects. Students will also participate in online discussion forums.

One major element of the content is the Code-Along videos. In these videos, students are asked to follow along with the instructor as they code. By coding in small chunks and pausing and repeating segments as necessary students are able to work through new topics at their own pace and work towards mastery of the material.

As they master these techniques, students are asked to combine them in longer exercises that let them build a deeper understanding of computer science and programming. Regular quizzes provide them feedback on their progress.

Content Overview

|$149|
Module 1: Beginning in Computer Science
Module 2: Number Calculations and Data
Module 3: Making Decisions
Module 4: Repetition and Loops
Module 5: Programming in EarSketch

|$199|
Modules 1-5 Plus:
Module 6: Graphics
Module 7: Functions
Module 8: Arrays
Module 9: 2D Arrays
Module 10: Programming in EarSketch
Module 11: Internet
Bonus: Exploring Careers in Computer Science
Modules 1-5 for $149

**Module 1: Beginning in Computer Science**
- Lesson 1: What is Computer Science?
- Lesson 2: Using Python
- Lesson 3: First Program
- Lesson 4: Hardware Basics
- Lesson 5: Output
- Lesson 6: Input
- Lesson 7: Data Types and Variables
- Lesson 8: Analog vs. Digital
- Lesson 9: Understanding Binary
- Exercise: Silly Sentences

**Module 2: Number Calculations and Data**
- Lesson 1: Computer History
- Lesson 2: Basic Calculations
- Lesson 3: Modular Division
- Lesson 4: Built-in Functions
- Lesson 5: Random Numbers
- Lesson 6: Big Data
- Lesson 7: Working with a Real Data Set
- Exercise: Room Area

**Module 3: Making Decisions**
- Lesson 1: Max and Min
- Lesson 2: Simple Ifs
- Lesson 3: Booleans
- Lesson 4: If – Else
- Lesson 5: Else – If
- Lesson 6: Defining Algorithms
- Lesson 7: Algorithm Challenge
- Exercise: Chatbot
Module 4: Repetition and Loops
Lesson 1: Loops
Lesson 2: Count Variables
Lesson 3: Two Ways to End a Loop
Lesson 4: Data Revisited
Lesson 5: Review - Looping
Lesson 6: Range Function
Lesson 7: For Loops
Lesson 8: Counting by Other Than 1
Lesson 9: Summing
Lesson 10: Review of Algorithms and Tracing
Lesson 11: Modeling and Simulation
Exercise: Evens and Odds

Module 5: Programming in EarSketch
Lesson 1: Getting Started with EarSketch
Lesson 2: The Building Blocks of a Program
Lesson 3: Debugging and Documenting
Lesson 4: Effects in EarSketch
Lesson 5: Effects and Envelopes
Lesson 6: Tempo and Pitch
Lesson 7: Copyright
Lesson 8: Evaluating Correctness
Lesson 9: Musical Form and Custom Functions
Lesson 10: Recording and Uploading Sounds
Lesson 11: Making Custom Beats
Lesson 12: Looping
Lesson 13: String Operations
Lesson 14: Musical Repetition
Exercise: Design a Ringtone in EarSketch
Modules 1-11 + Bonus Content for $199

**Module 6: Graphics**
- Lesson 1: Color Code
- Lesson 2: Colors and Loops
- Lesson 3: X & Y Coordinates
- Lesson 4: Lines
- Lesson 5: Draw a House
- Lesson 6: Circles
- Lesson 7: Emoticons
- Lesson 8: Animation
- Exercise: Animation

**Module 7: Functions**
- Lesson 1: What are Functions?
- Lesson 2: Creating Functions
- Lesson 3: Parameters
- Lesson 4: Returning Values
- Lesson 5: Using Several Functions
- Lesson 6: Tracing Code
- Exercise: Calendar

**Module 8: Arrays**
- Lesson 1: What are Arrays?
- Lesson 2: Declaring Arrays
- Lesson 3: Element vs Index
- Lesson 4: For Loops and Arrays
- Lesson 5: Array Functions
- Lesson 6: Arrays as Parameters
- Lesson 7: Arrays and Data
- Lesson 8: Sorting and Searching
- Lesson 9: Writing a Simple Search
- Lesson 10: Writing a Simple Sort
- Exercise: Personal Organizer
Module 9: 2D Arrays
Lesson 1: What is a 2D Array?
Lesson 2: Declaring 2D Arrays
Lesson 3: Loops with 2D Arrays
Lesson 4: Algorithms
Lesson 5: Algorithms Continued
Lesson 6: Tracing Code 2D
Exercise: 2D Arrays

Module 10: Programming in EarSketch
Lesson 1: Debugging Logic
Lesson 2: Evaluating Correctness
Lesson 3: Console Input and Conditionals
Lesson 4: Data Structures
Lesson 5: Randomness
Exercise: Create a Song of the Summer

Module 11: Internet
Lesson 1: What is the Internet?
Lesson 2: IP Addressing and DNS
Lesson 3: Packets and Routers
Lesson 4: Making Web Pages – HTML Part 1
Lesson 5: Making Web Pages – HTML Part 2
Lesson 6: Making Web Pages – HTML Part 3
Lesson 7: Cybersecurity
Lesson 8: Net Neutrality
Exercise: Build Your Own Webpage

Bonus: Exploring Careers in Computer Science
Lesson 1: Who Uses Computer Science?
Lesson 2: Data Scientists
Lesson 3: Computer Science in Medicine
Lesson 4: Game Developers
Lesson 5: Computer Science in Entertainment
Lesson 6: Dance and Music
Lesson 7: Cybersecurity
Lesson 8: Social Justice
Lesson 9: Sports
Lesson 10: Starting Your Own Business
Lesson 11: Web Design