

# Course Outline: CS Python Fundamentals

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This course is designed to offer an introduction to computer science. Students will learn the basics of computer 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 course was designed to be used in a blended classroom. The primary language for the course is Python. The course will consist of video lectures, daily programming exercises, longer coding assignments, regular quizzes, projects, and exams. 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 and tests give them feedback on their progress.

## Unit Overview

Unit 1: Beginning in Computer Science

Unit 2: Number Calculations and Data

Unit 3: Making Decisions

Unit 4: Repetition and Loops

Unit 5: Programming in EarSketch

Unit 6: Graphics

Unit 7: Functions

Unit 8: Arrays

Unit 9: 2D Arrays

Unit 10: Programming in EarSketch

Unit 11: Internet

# Units

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## Unit 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
- Assignment: Silly Sentences

## Unit 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
- Assignment: Room Area

## Unit 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
- Assignment: Chatbot

## Unit 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
- Assignment: Evens and Odds

## Unit 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
- Assignment: Design a Ringtone in EarSketch

## Unit 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
- Assignment: Animation

## Unit 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
- Assignment: Calendar

## Unit 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
- Assignment: Personal Organizer

## Unit 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
- Assignment: 2D Arrays

## Unit 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
- Assignment: Create a Song of the Summer

## Unit 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
- Assignment: Build Your Own Webpage

## 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

# Schedule

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## Week 01

- Welcome to the Course
- Introduction to EarSketch
- 1.1 What is Computer Science?
- 1.2 Using Python
- 1.3 First Program

## Week 02

- 1.4 Hardware Basics
- 1.5 Output
- 1.6 Input
- Unit 1 Quiz

## Week 03

- 1.7 Data Types and Variables
- 1.8 Analog vs. Digital
- 1.9 Understanding Binary

## Week 04

- Unit 1 Vocabulary & Test Review
- Unit 1 Assignment: Silly Sentences
- Unit 1 Test

## Week 05

- 2.1 Computer History
- 2.2 Basic Calculations
- 2.3 Modular Division
- 2.4 Built-in Functions

## Week 06

- 2.5 Random Numbers
- Unit 2 Quiz
- 2.6 Big Data
- 2.7 Working with a Real Data Set

## Week 07

- Unit 2 Vocabulary & Test Review
- Unit 2 Assignment: Room Area
- Unit 2 Test

## Week 08

- 3.1 Max and Min
- 3.2 Simple Ifs
- 3.3 Booleans
- 3.4 If – Else

## Week 09

- 3.5 Else – If
- Unit 3 Quiz
- 3.6 Defining Algorithms
- 3.7 Algorithm Challenge

## Week 10

- Unit 3 Vocabulary & Test Review
- Unit 3 Assignment: Chatbot
- Unit 3 Test

## Week 11

- 4.1 Loops
- 4.2 Count Variables
- 4.3 Two Ways to End a Loop

## Week 12

- 4.4 Data Revisited
- 4.5 Review - Looping
- 4.6 Range Functions

## Week 13

- 4.7 For Loops
- 4.8 Counting by Other Than 1
- Unit 4 Quiz

## Week 14

- 4.9 Summing
- 4.10 Review of Algorithms and Tracing
- 4.11 Modeling and Simulation

## Week 15

- Unit 4 Vocabulary & Test Review
- Unit 4 Assignment: Evens and Odds
- Unit 4 Test

## Week 16

- 5.1 Getting Started with EarSketch
- 5.2 The Building Blocks of a Program
- 5.3 Debugging and Documenting
- 5.4 Effects in EarSketch
- 5.5 Effects and Envelopes

## Week 17

- 5.6 Tempo and Pitch
- 5.7 Copyright
- 5.8 Evaluating Correctness
- 5.9 Musical Form and Custom Functions
- 5.10 Recording and Uploading Sounds
- 5.11 Making Custom Beats
- 5.12 Looping

## Week 18

- 5.13 String Operations
- 5.14 Musical Repetition
- Unit 5 Assignment: Design a Ringtone in EarSketch

## Week 19

- 6.1 Color Code
- 6.2 Color Revisited
- 6.3 X & Y Coordinates
- 6.4 Lines
- 6.5 Draw a House
- 6.6 Circle
- Unit 6 Quiz



## Week 20

- 6.7 Emoticons
- 6.8 Animation
- Unit 6 Vocabulary & Test Review
- Unit 6 Assignment: Animation
- Unit 6 Test

## Week 21

- 7.1 What are Functions?
- 7.2 Creating Functions
- 7.3 Parameters

## Week 22

- Unit 7 Quiz
- 7.4 Returning Values
- 7.5 Using Several Functions
- 7.6 Tracing Code

## Week 23

- Unit 7 Vocabulary & Test Review
- Unit 7 Assignment: Calendar
- Unit 7 Test

## Week 24

- 8.1 What are Arrays?
- 8.2 Declaring Arrays
- 8.3 Element vs Index
- 8.4 For Loops and Arrays
- 8.5 Array Functions

## Week 25

- Unit 8 Quiz
- 8.6 Arrays as Parameters
- 8.7 Arrays and Data
- 8.8 Sorting and Searching
- 8.9 Writing a Simple Search

## Week 26

- 8.10 Writing a Simple Sort
- Unit 8 Vocabulary & Test Review
- Unit 8 Assignment: Personal Organizer
- Unit 8 Test

## Week 27

- 9.1 What is a 2D Array?
- 9.2 Declaring 2D Arrays
- 9.3 Loops with 2D Arrays

## Week 28

- Unit 9 Quiz
- 9.4 Algorithms
- 9.5 Algorithms Continued
- 9.6 Tracing Code 2D

## Week 29

- Unit 9 Vocabulary & Test Review
- Unit 9 Assignment: 2D Arrays
- Unit 9 Test

## Week 30

- 10.1 Debugging Logic
- 10.2 Evaluating Correctness
- 10.3 Console Input and Conditionals
- 10.4 Data Structures
- 10.5 Randomness

## Week 31

- Unit 10 Assignment: Create a Song in EarSketch

## Week 32

- 11.1 What is the Internet?
- 11.2 IP Addressing and DNS
- 11.3 Packets and Routers

## Week 33

- 11.4 Making Web Pages – HTML Part 1
- Unit 11 Quiz
- 11.5 Making Web Pages – HTML Part 2
- 11.6 Making Web Pages – HTML Part 3
- 11.7 Cybersecurity

## Week 34

- 11.8 Net Neutrality
- Unit 11 Vocabulary & Test Review
- Unit 11 Assignment: Build Your Own Webpage
- Unit 11 Test

## Week 35 - Careers in CS Module

- Lesson 1: Who Uses Computer Science?
- Lesson 2: Data Scientist
- Lesson 3: Computer Science in Medicine
- Lesson 4: Game Developer
- Lesson 5: Computer Science in Entertainment
- Lesson 6: Dance and Music

## Week 36 - Careers in CS Module

- Lesson 7: Game Designers
- Lesson 8: Journey to Cryptography
- Lesson 9: Social Justice
- Lesson 10: Sports
- Lesson 11: Starting Your Own Business
- Lesson 12: Web Design
- Course Wrap-Up