

Course Outline:

Introduction to Computer Science

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 semester 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 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 they 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

Term 1

Unit 1: Beginning in Computer Science

Unit 2: Number Calculations and Data

Unit 3: Making Decisions

Unit 4: Repetition with Loops

Unit 5: Graphics

Term 2

Unit 6: For Loops

Unit 7: Text and String Processing

Unit 8: Subprograms

Unit 9: Arrays

Unit 10: 2-D Arrays

Unit 11: Internet



Unit 1: Beginning in Computer Science

Lesson 1: What is Computer Science?

Lesson 2: Using Python – Installing and online IDE

Lesson 3: First Program

Lesson 4: Hardware Basics

Lesson 5: Output – ASCII Art

Lesson 6: Input

Lesson 7: Data Types and Variables

Lesson 8: Analog vs. Digital

Lesson 9: Bits and Pieces – understanding Binary

Lesson 10: Career Connection – who uses computer science?

Final Project

Other Activities:

- Secret Messages
- Scratch Assembly Language Simulator

Unit 2: Number Calculations and Data

Lesson 1: Why do we use Computers? A history

Lesson 2: Simple Calculations

Lesson 3: Modular Division

Lesson 4: Built in Functions

Lesson 5: Random Numbers

Lesson 6: Painting a Picture

Lesson 7: Big Data

Lesson 8: Working with a real data set

Lesson 9: Career Connection: Data Scientists

Final Project

Other Activities:

- [Logic.ly website](https://logic.ly)

Unit 3: Making Decisions

Lesson 1: Challenge – Max and Min

Lesson 2: Simple if's

Lesson 3: Booleans

Lesson 4: If - Else

Lesson 5: If – Then - Else

Lesson 6: Defining Algorithms

Lesson 7: Algorithm Challenge

Lesson 8: History – Turing Machines

Lesson 9: Career Connection – Computer Science in Medicine

Final Project: Therapy Chicken

Other Activities:

- Lightbot
- Artificial Intelligence
- Logic.ly again – and /or gates?

Unit 4: Repetition with Loops

Lesson 1: Simple While Loop

Lesson 2: Two ways of ending a loop

Lesson 3: Count Variables

Lesson 4: Data Revisited

Lesson 5: Connection – Games with a Purpose (GWAP)

Lesson 6: Making a game

Lesson 7: Internet - Cybersecurity

Lesson 8: Career Connection: Game Developers

Final Project

Other Activities:

- Ted Talks on GWAP
- Data Mining
- Wall – E clips about how sounds were made

Unit 5: Graphics

Lesson 1: Color Revisited

Lesson 2: When will I ever Use this? X, Y coordinates – or how your screen works

Lesson 3: Lines

Lesson 4: Draw a House

Lesson 5: Circles

Lesson 6: Emoticon Program

Lesson 7: Kaleidoscope

Lesson 8: Animation

Lesson 9: History of Movies – Edweard Muybridge

Lesson 10: Career Connection – Computer Science in Entertainment

Final Project: Winter / Summer Scene with animation

Other Activities:

- Pixar Shorts



Unit 6: For Loops

Lesson 1: Review - Looping

Lesson 2: Range Function

Lesson 3: For Loops

Lesson 4: Counting other than 1

Lesson 5: Summing

Lesson 6: Review Algorithms and Tracing Code

Lesson 7: Modeling and Simulation

Lesson 8: Career Connection – Scientists that Code

Final Project: TBD



Unit 7: Text and String Processing

Lesson 1: ASCII and Character Functions

Lesson 2: Processing Strings

Lesson 3: Text Files - Input

Lesson 4: Text Files - Output

Lesson 5: Copying Files

Lesson 6: Processing Strings in Files

Lesson 7: Career Connection – Game Designers

Final Project: Text-Based Game



Unit 8: Subprograms

Lesson 1: What are subprograms?

Lesson 2: Creating Subprograms

Lesson 3: Parameters

Lesson 4: Code.org video – Chris Bosch on Functions

Lesson 5: Functions – Returning values

Lesson 6: TBD

Lesson 7: TBD

Lesson 8: Career Connection

Final Project: TBD



Unit 9: 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: TBD

Lesson 8: Career Connection

Final Project: TBD

Unit 10: 2-D Arrays

Lesson 1: What is a 2-D Array?

Lesson 2: Declaring and Sorting Data

Lesson 3: Loops with 2-D Arrays

Lesson 4: Algorithms – Part 1

Lesson 5: Algorithms – Part 2

Lesson 6: Tracing Code – Looking for Errors

Lesson 7: Career Connection

Lesson 8: TBD



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: Encryption

Lesson 9: Career Connection

Final Project: Build a web site