FOCUS LEARNING

Python Overview

Road Map and Curriculum

2020-2021

Python Road Map

General Information

Why do we offer these courses?

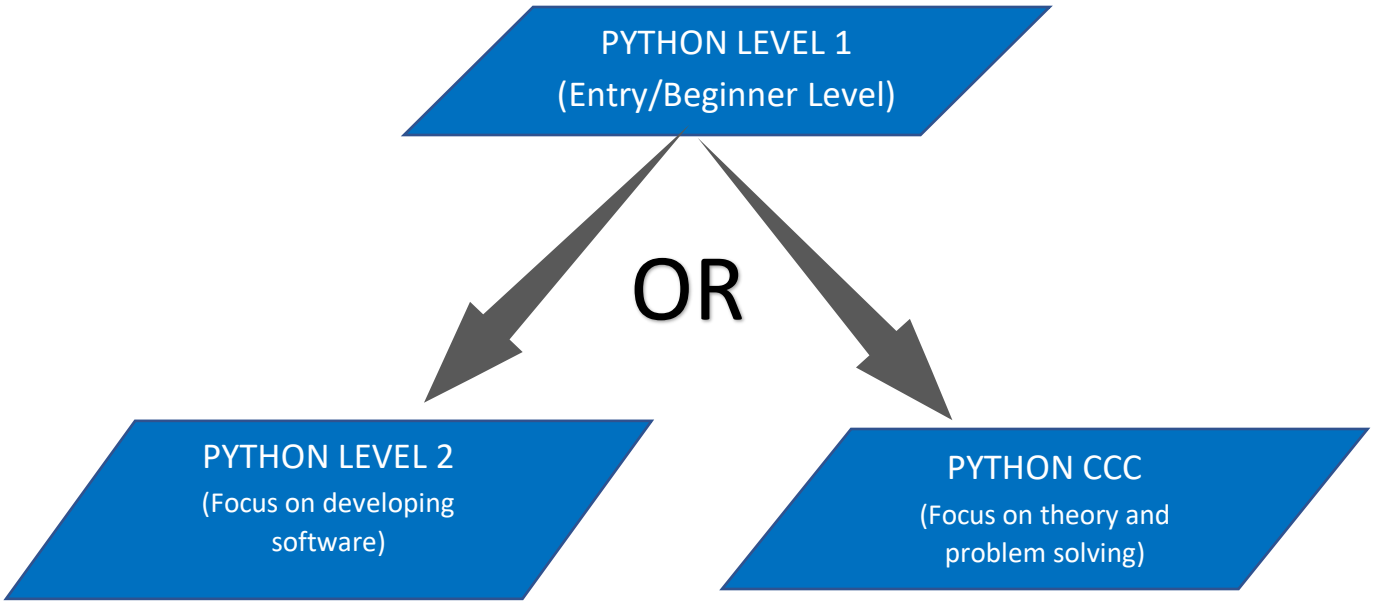
We believe programming is a very useful and important skill to have. This will help prepare STEM students for the future.

Who are these courses for?

This is for students interested in STEM and for students who are curious and willing to try something new.

How are these course taught?

The courses are taught in person or online. There will be lectures, activities and projects.



All students should start at level 1. Upon completion of level 1 students may choose between level 2 or CCC which have different focuses. Note that prior students who have completed Python level 0 during the summer should also join Python level 1 in the Fall/Winter term, but will be put into a fast tracked version of level 1 along with other students who have completed level 0.

Python Level 1 Curriculum

Grades 4-8

Python Level 1 (Entry/Beginner) is a full school year course starting in September and ending in June. This course is designed for students new to programming and students with or without prior programming experience are welcome. In this course, students will learn the fundamentals of programming in Python and elementary concepts applicable to any programming language. Students will also be introduced to simple UI design, animations and game design via Processing in Python mode. By the end, students will have the tools necessary to create their own simple Python projects from scratch. Note that students that have completed level 0 and want to continue should take this course. Students that completed level 0 will be grouped together in an accelerated version of level 1.

Module 1: Intro to Python
Skills:
1. Basics of Python
2. Basics of Processing
3. Advanced Processing
Projects:
1. Game main menu / Drawing a picture
2. Dot to Dot project

Here, students will get setup with Python and Processing. They will be introduced to elementary concepts and work their way to more advanced concepts specific to Processing. By the end, students will have completed their first major project.

Module 2: The tools of Python
Skills:
1. If-statements and Loops
2. List data structure
3. Functions
Projects:
1. Simple Processing Game

In this module, students will begin to learn about more advanced topics specific to Python. The concepts and tools taught in this module will make it possible for students to code games and more interesting projects in the next module.

Module 3: Putting it all together
Skills:
1. Simple collision detection
2. Combining different tools in Python
3. Code neatness and commenting
Projects:
1. Final project for term (Ex/ Flappy Bird)

In this last module, students will apply the tools that they have learned in module 2 to create a variety of beautiful games. Along the way, students will be challenged to think outside the box to come up with elegant solutions for the core mechanics of the games they produce.

Note: Projects and skills may vary due to many factors. For example, a project may be switched for another one if too many returning students have completed it in the past. The content shown in the blue boxes are only a small set of the full list of skills and projects.

Python Level 2 Curriculum

Grades 6-8

Python Level 2 is a full school year course starting in September and ending in June. This course is designed for students with prior Python programming experience and have a solid understanding of core Python concepts. In this course, students will continue applying fundamental concepts in both Python and Processing in Python mode to create finished projects. Students will also be introduced to advance topics such as edge detection in image processing, motion detection and object-oriented programing. This course is designed and meant for students who enjoy making applications and working on projects.

Module 1: Back to Python
Skills:
1. Functions
2. Loops and If-statements
3. Processing
Projects:
1. Interactive screen saver

Here, students will get a detailed review of what they have learned back in Python level 1 and a selection of topics will be handpicked to be taught in much greater detail then it was taught in level 1.

Module 2: More tools in Python
Skills:
1. Parsing text files and saving data to files
2. Classes
3. Retrieving date and time
Projects:
1. Text Searcher
2. Virtual Alarm Clock

In this module, students will learn about a variety of advanced tools available in Python used in the industry. This module will ensure students have the complete tool kit in order to begin producing code at the professional level.

Module 3: Advanced software development
Skills:
1. Image analysis and manipulation
2. Collision detection with game platforms
Projects:
1. A processing game (Ex/ Snake)
2. Final project for term (Ex/ Edge Detection)

In this final module, students will take everything they have learned in level 1 and level 2 to create a variety of applications. Students will also look at implementing solutions to real life problems.

Note: Projects and skills may vary due to many factors. For example, a project may be switched for another one if too many returning students have completed it in the past. The content shown in the blue boxes are only a small set of the full list of skills and projects.

Python CCC

Grades 7-8

Python CCC (Canadian Computing Competition) is a full school year course starting in September and ending in June. This course is designed for students with prior Python programming experience and have a very strong understanding of core Python concepts. The purpose of this course is to prepare students for the Canadian Computing Competition held by the University of Waterloo. In this course, students will focus more on the theoretical side of coding and serves as a solid introduction to Computer Science. Many of the topics covered in level 2 are also covered in Python CCC. Students must have level 1 completed before entering this course.

Module 1: Algorithms and Python Review
Skills:
1. Sorting and searching algorithms
2. Recursion
3. Multi-dimensional lists
Projects:
1. Breaking the N-d list
2. Exploring the efficiency of algorithms

Here, students will get a detailed review of what they have learned back in Python level 1 and a selection of topics will be handpicked to be taught in much greater detail then it was taught in level 1. In addition, new concepts will be taught that students will need for the CCC.

Module 2: Competition Prep
Skills:
1. Understanding mathematical symbols used in CCC
2. Reading and breaking down hard questions
3. Learning the tools provided by the CCC
Projects:
1. Past CCC exams

In this module, students will begin preparing for the CCC by completing old exams from previous years. In doing so students will learn about the type and style of questions asked on the exam. Students will also become familiar with the web interface in which they will be writing the actual exam.

Module 3: Solving real world problems
Skills:
1. Artificial intelligence
2. Data analysis
3. Simple physics-based animations
Projects:
1. Motion sensor
2. Ball bounce simulator
3. Final project for term (Ex/Sentiment analysis)

This final module takes place after the CCC and gives students a chance to explore different subfields under Computer Science. Students will be exposed to cutting edge technology and solve real world problems using the concepts learn in this module.

Note: Projects and skills may vary due to many factors. For example, a project may be switched for another one if too many returning students have completed it in the past. The content shown in the blue boxes are only a small set of the full list of skills and projects.