Course Description

2022-2023, Fall

September 17th, 2022 – January 29th, 2023, 16 weeks

No classes on Statutory Holiday Long Weekends

Teacher: Kavan Lam

Course Name: Object-oriented programming in Python

Students' Grades: 7-10

What kind of students is this course most suitable for?

This course is most suitable for intermediate level students looking to expand their programming knowledge past the basics and work on more challenging projects. Students specifically looking to learn about object-oriented programming will benefit the most from this course.

Course Summary:

An intermediate course in Python for student with prior programming experience. This course focuses on expanding students' existing Python programming skills and taking it to the next level with object-oriented programming. Students will learn how to define their own classes and all the terminology in relation to object-oriented programming. Topics such as inheritance, methods, attributes and polymorphism will be covered. Along the way students will apply object-oriented programming to a variety of projects such as image edge detection and video games.

What you will learn:

In term one students will touch 5 of the 8 units being offered in the course. For the first unit (4 weeks), students will get a refresher on if statements, while loops, for loops, data types, list and dictionaries. While reviewing these Python fundamentals, a more complete approach will be taken to ensure students have a strong base line. The second unit (1 week) will be a short and simple introduction/review of Processing which will act as the main interface where students will write code. Moving into the third unit (3 weeks) will have students learning about Python Function and using them to solve a variety of problems. The fourth and most important unit (6 weeks) is where students will learn about object-oriented programming and many of the core principals revolving around OOP. Students will learn what classes are and how to build their own. Topics such as inheritance and polymorphism are also covered. The fifth and last unit of the term (2 weeks) will cover animations and user interactions in Processing using an object-oriented approach.

Materials & Course Prerequisites:

1) A working microphone and webcam is required
2) Students must have access to a computer with a strong internet connection
3) All students taking this course must have completed and done sufficiently well in the prerequisite Python coding course offered at Focus Learning or pass the entry test (please contact Focus Learning for more details)

Homework Requirements:

Homework will be assigned on the weekly basis and students will always be given one or more weeks to complete the assigned homework. Homework is not required to be completed but it is highly recommended. Homework will be graded and feedback will be shared with student online using Google Docs.

Weekly lesson plans:

UNIT 1: Weeks 1-4
Theme/project of this unit: A deeper look at Python fundamentals

WEEK	MAIN CONTENT	MAIN APPROACHES OR ACTIVITIES
Week 1	- Conditional statements and looping - Data types	- Review how if statements, for loops and while loops are structured and how they work - Solving simple problems involving loops - Practice problems
Week 2	- Python List - Loops	- Review of 1D and 2D Python List - Solving problems involving Lists and loops - Practice problems
Week 3	- Python Dictionaries - Python List	- Review of Dictionaries and compare to Lists - Solving problems involving Dictionaries and List - Challenge questions
Week 4	- User input - List comprehension - Sets and tuples	- Review how to receive user input from keyboard and work

		on problems involving user input. - Demo and explanation of list comprehensions - Learn about sets and tuples and compare them with Lists and Dictionaries
UNIT 2: Week 5 **Theme/project of this unit:** Introduction to Processing		
WEEK	**MAIN CONTENT**	**MAIN APPROACHES OR ACTIVITIES**
Week 5	- Installing Processing - Basics of Processing - Shapes, text and colors	- Review what Processing is and the basics (saving work, opening multiple sketches and tools) - Review how to draw simple geometry and text in using Processing - Review colors and font style
UNIT 3: Weeks 6-8 **Theme/project of this unit:** Python Functions		
WEEK	**MAIN CONTENT**	**MAIN APPROACHES OR ACTIVITIES**
Week 6	- Introduction to Functions	- Explain what functions are and why they are useful - The structure of functions and how to create one - Students will complete an exercise on creating simple functions
Week 7	- More advanced Functions - Default parameters	- Create more complex Function - Students will design Functions to solve problems

Week 8	- Functions in Processing - Using Functions for graphics - Solving problems involving multiple functions	- Students will design a Function to draw a house in Processing - Students will solve data processing problems using multiple Functions
UNIT 4: Weeks 9-14 **Theme/project of this unit:** Python Classes		
WEEK	**MAIN CONTENT**	**MAIN APPROACHES OR ACTIVITIES**
Week 9	- Introduction to object-oriented programming	- What are objects in Programming and what is OOP - How to structure and write a class in Python - Methods and attributes - Students will create simple classes
Week 10	- Special methods - Working with multiple classes	- What are special methods and how to code them - Solving problems involving multiple classes
Week 11	- Inheritance, encapsulation, polymorphism and abstraction	- Apply the concept of inheritance to build classes that can be used to model real-world objects/processes - Practice problems
Week 12	- More on Inheritance - Introduce the Farm Animals project	- Focus on inheritance and work on many practice problems
Week 13	- Farm Animals project	- Student will get all of class time to work on the Farm Animals project

Week 14	- Farm Animals project	- Student will get all of class time to work on the Farm Animals project
UNIT 5: Weeks 15-16 **Theme/project of this unit:** Graphics in Processing		
WEEK	**MAIN CONTENT**	**MAIN APPROACHES OR ACTIVITIES**
Week 15	- OOP approach to animations using Processing - OOP approach to user interactions using Processing	- Work on exercises involving animating simple geometry with collisions with OOP in mind - Learn how to process user interactions for video game objects with OOP in mind
Week 16	- OOP approach to images and sounds in Processing	- Student will work on exercises involving sound and image files - Demo on how images and sounds are used in Processing