

Course Description Term 2

2022-2023, Fall

February 4th, 2023 – June 17th, 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 two, students will get the opportunity to apply everything they learned in term 1 in a variety of projects. The second term will consist of 4 units. The first two will focus on the creation of video games with a heavy focus on OOP while the last two will focus on image processing and analysis. Along the way students will learn how to implement graphics, sounds, complex user inputs, collision detection, basic game artificial intelligence, image edge detection and how images are represented in code.

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: Video game project 1

WEEK	MAIN CONTENT	MAIN APPROACHES OR ACTIVITIES
Weeks 1-4	<ul style="list-style-type: none"> - Video game project - Complex user interactions - Collision detection - Sounds and images in processing 	<ul style="list-style-type: none"> - Students will be assigned a video game project that is to be completed in 4 weeks - Students will have plenty of class time to work on their projects

UNIT 2: Weeks 5-8

Theme/project of this unit: Video game project 2

WEEK	MAIN CONTENT	MAIN APPROACHES OR ACTIVITIES
Week 5-8	<ul style="list-style-type: none"> - Complex video game project - Basic game artificial intelligence 	<ul style="list-style-type: none"> - Students will be assigned another video game project that is more difficult and is to be completed in 4 weeks - Students will have plenty of class time to work on their projects

UNIT 3: Weeks 9-12

Theme/project of this unit: Image and video processing in Python

WEEK	MAIN CONTENT	MAIN APPROACHES OR ACTIVITIES
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Week 9	<ul style="list-style-type: none"> - Learn how images are represented in code - Learn about pixels and image manipulations at the pixel level 	<ul style="list-style-type: none"> - Students will explore what images are like behind the scenes - Students will write Python code to manipulate images
Week 10	<ul style="list-style-type: none"> - Continue learning about images in code - Work on making more complex image manipulations such as image blurring 	<ul style="list-style-type: none"> - Continue to work on writing code to perform image manipulations
Week 11	<ul style="list-style-type: none"> - Introduce the green screen project - Learn how green screens work - Cover the algorithm that will be used to make a functioning green screen 	<ul style="list-style-type: none"> - Students will get started on the green screen project and will have class time to work on it
Week 12	<ul style="list-style-type: none"> - Finishing the green screen project 	<ul style="list-style-type: none"> - Students will get class time to work on and finish the green screen project - Last quarter of class time will be used to take up the project and do live demonstrations
UNIT 4: Weeks 13-16 Theme/project of this unit: Image edge detection project and motion detection		
WEEK	MAIN CONTENT	MAIN APPROACHES OR ACTIVITIES
Week 13	<ul style="list-style-type: none"> - Learn about what edges are and how they can be detected in images - Learn about the applications of edge detection - Cover the algorithm that will be used to detect edges 	<ul style="list-style-type: none"> - Students will explore what an edge is mathematically and apply it in code - Students will receive a demo of edge detection in action

Week 14	<ul style="list-style-type: none"> - Continuation of last week 	<ul style="list-style-type: none"> - Students will get all of class time to code a simple image edge detector
Week 15	<ul style="list-style-type: none"> - Learn about the different ways motion can be detected in videos - Learn about OpenCV and how to install it - Learn about a simple algorithm that can be used to detect motion in video 	<ul style="list-style-type: none"> - Students will explore different ways motion can be detected and how to mathematically quantify motion - Students will receive a live demo of motion detection
Week 16	<ul style="list-style-type: none"> - Continuation of last week 	<ul style="list-style-type: none"> - Students will get all of class time to code a simple motion detector that uses their webcams