



Python

with CoDrone EDU



Course

Python and CoDrone EDU

This course is designed to introduce students to Python programming in a way that is approachable for beginners while still building a strong foundation in core computer science concepts. Using Python with the CoDrone EDU, students will learn how to write text-based code to control the drone and interact with its sensors. Learners can start this course after completing the Blockly curriculum, or begin directly with Python if they are ready to dive into text-based programming.

This course uses:



CoDrone EDU / CoDrone EDU (JROTC ed.)



Python



Timeframe

Quarter



Total lessons

30 lessons



Difficulty



本課程旨在以易於初學者理解的方式向學生介紹 Python 編程，同時夯實電腦科學核心概念的基礎。學生將使用 Python 和 CoDrone EDU 無人機，學習如何編寫基於文字的程式碼來控制無人機並與其感測器進行互動。學習者可以在完成 Blockly 課程後開始學習本課程，也可以直接學習 Python，如果他們已經準備好深入學習以文字為基礎的程式設計。

Unit 1 - Getting to Know Your CoDrone EDU

1.1 Introduction to CoDrone EDU

This lesson will introduce students to what drones are and how they are used. Students will also begin to familiarize themselves with the CoDrone EDU and its components.

1.2 Before You Fly

Safety is the number one priority of any pilot. Learn about how to fly the CoDrone EDU safely and how to prevent damage to your drone before it even leaves the ground.

1.3 The Controller

Learn the fundamentals of the controller, including what the buttons do, what the settings are, and how to pilot your drone. If it's your first time using the CoDrone EDU, you will definitely want to go through this lesson before flying.

1.4 Troubleshooting

As with any technology, sometimes students might run into issues that they have to work through. This lesson teaches students the skills to troubleshoot different scenarios that may arise while using the CoDrone EDU.

單元 1 - 了解您的 CoDrone EDU

1.1 CoDrone EDU 簡介

本課將向學生介紹無人機的概念及其用途。學生還將開始熟悉 CoDrone EDU 及其組件。

1.2 飛行前準備

安全是所有飛行員的首要任務。學習如何安全操控 CoDrone EDU，以及如何在無人機起飛前防止損壞。

1.3 遙控器

學習遙控器的基本操作，包括按鈕功能、設定選項以及如何操控無人機。如果您是第一次使用 CoDrone EDU，強烈建議您在飛行前學習本課。

1.4 故障排除

與任何技術一樣，學生有時可能會遇到需要解決的問題。本課程將教導學生在使用 CoDrone EDU 時排除各種故障的技能。

<https://learn.robotlink.com/codrone-edu/python-with-codrone-edu>

Unit 2 - Basic Movements

In this Unit, students will learn how to control the CoDrone EDU using Python. They will explore how pitch, roll, throttle, and yaw control movement, and write programs that make the drone take off, hover, land, and fly along specific paths. Students will also be introduced to variables, operators, and loops to make their programs more efficient and adaptable.

2.1 First Flight- The first flying lesson using Python! Learn how to program your drone to take off, hover in place, and land safely.

2.2 Flight Movements: Roll and Pitch- Learn how to use Python to control your drone's forward, backward, and side-to-side movement with pitch and roll, combining them to fly along a path.

2.3 Flight Movements: Throttle and Yaw- Learn how to use Python to control your drone's turning and vertical movements with yaw and throttle, creating more complex flight paths.

2.4 Introduction to Variables- Learn how to create and use integer and float variables in Python to make your drone programs more efficient and flexible.

2.5 Operator and String Variables- Learn how to update variables with math operators and use strings to add context, making your drone programs even more flexible, clear, and easy to adjust.

2.6 For Loops- Learn how to use for loops in Python to repeat actions, simplify your code, and make your drone fly patterns like squares or gradual takeoffs and landings.

<https://codrone.robotlink.com/edu/python>



第二單元 - 基本運動

在本單元中，學生將學習如何使用 Python 控制 CoDrone EDU 無人機。他們將探索如何透過俯仰、橫滾、油門和偏航來控制無人機的運動，並編寫程式使無人機起飛、懸停、降落以及沿著特定路徑飛行。學生還將學習變數、運算符和循環，以提高程式的效率和適應性。

2.1 首次飛行 - 使用 Python 進行首次飛行課程！學習如何編寫程式使無人機起飛、懸停並安全降落。

2.2 飛行運動：橫滾和俯仰 - 學習如何使用 Python 透過俯仰和橫滾來控制無人機的前進、後退和左右運動，並將它們結合起來使無人機沿著特定路徑飛行。

2.3 飛行運動：油門和偏航 - 學習如何使用 Python 透過偏航和油門來控制無人機的轉彎和垂直運動，從而創造更複雜的飛行路徑。

2.4 變數簡介 - 學習如何在 Python 中建立和使用整型和浮點型變量，以提高無人機程式的效率和靈活性。

2.5 運算子和字串變數 - 學習如何使用數學運算子更新變量，以及如何使用字串添加上下文，使您的無人機程式更加靈活、清晰且易於調整。

2.6 for 迴圈 - 學習如何在 Python 中使用 for 迴圈重複操作、簡化程式碼，並使您的無人機能夠飛行正方形圖案或進行漸進式起飛和降落。

Unit 3 - Feedback and Control Structures

In this Unit, students will learn how to make their drone programs more interactive and responsive using feedback and control structures. They will program LEDs and buzzers to provide visual and audio feedback, use random values to create variety, and apply loops and conditionals to make the drone respond to real-time conditions like battery level. Students will also learn how to measure time within their programs and use it to control when certain actions happen.

3.1 LEDs- Learn how to use Python to control the LEDs on your drone and controller, combining RGB values to create colors that give visual feedback during flight.

3.2 Buzzers- Learn how to use Python to control the buzzers on your drone and controller, using frequencies and notes to create sounds that provide audio feedback during flight.

3.3 Random- Learn how to use Python to add randomness to your programs, using the randint() function with LEDs, buzzers, and flight movements to create unique lights, sounds, and behaviors every time your code runs.

3.4 Battery and While Loops- Learn how to use Python to check your drone's battery level and use while loops to repeat actions while it has enough power, then land safely when the battery gets low.

3.5 Conditionals: If and Else- Learn how to use if and else statements in Python so your drone can react to different situations, like following green, yellow, and red traffic-light rules.

3.6 Conditionals: Elif- Learn how to build on if and else statements by adding elif, so Python can check conditions in order and make your drone respond in different ways based on which condition is true.

3.7 Timers- Learn how to use time as a condition in a while loop, compare time() and ctime(), and control how long your drone performs actions by measuring elapsed time.

3.8 Boolean Logic- Learn how to use Boolean operators like AND, OR, and NOT to combine conditions, so your program can make more complex decisions and control how a drone behaves.

第三單元 - 回饋與控制結構

在本單元中，學生將學習如何使用回饋和控制結構，使他們的無人機程式更具互動性和回應性。他們將編寫程式來控制 LED 燈和蜂鳴器，以提供視覺和聽覺回饋；使用隨機值來創造多樣性；並應用循環和條件語句，使無人機能夠響應電池電量等即時狀況。學生還將學習如何在程式中測量時間，並利用時間控制特定動作的執行時間。

3.1 LED 燈 - 學習如何使用 Python 控制無人機和控制器上的 LED 燈，透過組合 RGB 值來創建顏色，從而在飛行過程中提供視覺回饋。

3.2 蜂鳴器 - 學習如何使用 Python 控制無人機和控制器上的蜂鳴器，透過頻率和音符來創造聲音，從而在飛行過程中提供聽覺回饋。

3.3 隨機性 - 學習如何使用 Python 為程式添加隨機性，將 randint() 函數與 LED 燈、蜂鳴器和飛行動作結合使用，從而在每次程式碼運行時創建獨特的燈光、聲音和行為。

3.4 電池電量和 while 循環 - 學習如何使用 Python 檢查無人機的電池電量，並使用 while 循環在電量充足時重複執行操作，然後在電量不足時安全降落。

3.5 條件語句：if 和 else - 學習如何在 Python 中使用 if 和 else 語句，使無人機能夠對不同的情況做出反應，例如遵循綠燈、黃燈和紅燈的交通規則。

3.6 條件語句：elif - 學習如何在 if 和 else 語句的基礎上添加 elif，以便 Python 可以按順序檢查條件，並根據哪個條件為真使無人機做出不同的響應。

3.7 定時器 - 學習如何在 while 迴圈中使用時間作為條件，比較 time() 和 ctime() 函數，並透過測量經過的時間來控制無人機執行操作的持續時間。

3.8 布林邏輯 - 學習如何使用 AND、OR 和 NOT 等布林運算符來組合條件，使程式能夠做出更複雜的決策並控制無人機的行為。

Unit 4 – Sensors in Python

4.1 Sensors Introduction- To this point, most of the inputs we have learned have been contained within the drone's code. But did you know the drone can sense and understand information about its environment? In this lesson, we will get a general understanding of how sensors can be used to make more intelligent programs.

4.2 Battery- Your CoDrone EDU doesn't have a battery indicator on it like your computer or phone, but you can retrieve the battery percentage with code! Learn how to program your CoDrone EDU to let you know when the battery is low.

4.3 Temperature and Air Pressure- Your CoDrone EDU has sensors that turn it into a makeshift weather balloon. In this lesson, your CoDrone will be a meteorologist and read and print both its temperature and air pressure.

4.4 Gyroscope- Gyroscope (gyro) sensors are a lot like compasses — they sense rotational motion and detect orientation to figure out what direction something is facing. They're used in everything from space shuttles to cell phones, and now your CoDrone EDU! In this lesson, you will learn how your CoDrone EDU's gyroscope works and how to program it.

4.5 Bottom Range (Height) Sensor- You used the barometer to measure air pressure in a previous lesson. In this lesson, you're going to learn how to use the height sensor to estimate altitude.

4.6 Front Range Sensor- In this lesson we will learn the basics of the front range sensor located on the front of the CoDrone EDU. This sensor can be used to measure how far the drone is from an object!

4.7 Color Sensor- In this lesson we will learn how to access and use the color sensor located on the bottom of the CoDrone EDU. We will learn how to calibrate and code the CoDrone EDU to see colors!

第四單元 – Python 中的感測器

4.1 感測器簡介 – 到目前為止，我們學習的大部分輸入都包含在無人機的程式碼中。但是你知道無人機可以感知並理解周圍環境的資訊嗎？在本課中，我們將大致了解如何使用感測器來編寫更聰明的程式。

4.2 電池 – 你的 CoDrone EDU 沒有像電腦或手機那樣的電池指示燈，但你可以透過程式碼取得電池百分比！學習如何編寫程序，讓你的 CoDrone EDU 在電池電量低時發出提醒。

4.3 溫度和氣壓 – 你的 CoDrone EDU 配備了感測器，可以將其變成一個簡易的氣象氣球。在本課中，你的 CoDrone 將扮演氣象學家的角色，讀取並列印溫度和氣壓。

4.4 陀螺儀 – 陀螺儀（或稱為陀螺儀）感應器與指南針非常相似 - 它們感知旋轉運動並偵測方向，從而確定物體朝向哪個方向。從太空梭到手機，陀螺儀的應用無所不在，現在你的 CoDrone EDU 也用上了！在本課中，你將學習 CoDrone EDU 的陀螺儀的工作原理以及如何對其進行編程。

4.5 底部距離（高度）感測器 - 在先前的課程中，你已經使用氣壓計測量了氣壓。在本課中，你將學習如何使用高度感測器來估算飛行高度。

4.6 前距離感測器 - 在本課中，我們將學習位於 CoDrone EDU 前部的前距離感測器的基本知識。此感測器可用於測量無人機與物體之間的距離！

4.7 顏色感測器 - 在本課程中，我們將學習如何存取和使用位於 CoDrone EDU 底部的顏色感測器。我們將學習如何校準和編程 CoDrone EDU 以使其能夠識別顏色！