



EV3 with Python 5-6 Syllabus

Course Goals

1 Understand Programming Basics with Python

Students use Python to learn basic principles of programming. They develop their programming skills further by writing scripts to solve a variety of challenges.

2 Develop Interactive Programming Skills

Students learn to develop programs that go beyond the computer and into the real world. They program their robots to act in the real world based on input from sensors.

Course Topics

1 Programming Basics and Computer Math

Students learn about the basic syntax of the Python programming language and how to use it to solve simple math problems.

2 Variables

Students use variables to store and reference different types of data. They use variables to connect to the motors and sensors of the EV3 and control them.

3 The ev3dev Operating System

Students learn about the different versions of the Linux Operating System, ev3dev in particular. They learn to connect to the robot's operating system and transfer files using common software utilities.

4 Control Flow

Students learn to modify the ordering and commands in their programs by using conditionals and loops. They use these structures to make their robots move autonomously through their environment.

5 Problem Solving Strategies in Programming

Students learn how to employ problem solving strategies in programming to break down a large challenge into small pieces of code.

6 Robotic Motion

Students learn to build robots that roll and walk and tackle the challenges that come with programming careful and precise robot movement.

Course Schedule

Day 1

Class Introduction

Students introduce themselves to the instructors and their classmates. They learn about the basics of the course and find partners they will work with for the two weeks.

Introduction to Robotics and EV3

Students learn about the field of robotics and some applications.

Construction of EducatorBot

Students build their first robot, the EducatorBot, and use it to learn basics of robot construction and programming.

Day 2

Install ev3dev Operating System

Students learn how to install the ev3dev environment on their robots. They learn how to connect their robots to their computers and how to access the robot's operating system.

Programming with Python

Students begin learning about programming and how to write programs with Python. Students use Python's IDLE interface to learn about computer math and variables.

Python on the EV3

Students learn how to write programs for the EV3 robot using Python. Students learn to import the EV3 library and create and run scripts on the EV3.

Day 3

Writing and Running Python Scripts on the EV3

Students learn to create executable Python scripts and install them on the EV3's operating system. Students use scripts to make multiple commands run in a row, instead of typing them in one at a time.

Robot Movement Challenges

Students practice their Python and EV3 programming skills to complete several challenges based around movement with the EV3.

EV3 Sensors

Students learn about how to use the different sensors in the EV3 kit to interact with their surroundings. They practice reading values from the sensors using Python.

If-Statements

Students learn how to use If-Statements to change the flow of their program based on certain conditions.

Day 4

Automating with Loops

Students use while loops in Python to make their robot repeat actions until a condition is met. Students use these, along with If statements, to make their robots autonomous.

Sensor Programming Challenges

Students practice programming with the EV3 sensors to complete a series of challenges.

Programming and Problem Solving

Students discuss problem solving techniques and how to apply these when programming.

Day 5

Challenge: Color Maze

Students use the programming techniques they have learned to teach their robot to navigate a maze based on different colors. Students create methods with Python to solve smaller problems as part of the challenge.

Day 6

Review Programming Concepts

Students review the programming concepts and syntax they learned in the previous week.

Review Color Maze

Students review the color maze activity and discuss solutions to each of the mazes.

Building Anty

Students build Anty, a robotic ant that walks on six legs.

Day 7

Using Methods to Program Anty

Students learn to write their own methods to encapsulate small pieces of a program's functionality. They use methods to calibrate Anty and make him walk.

Anty's Obstacle Course

Students use Anty to navigate an obstacle course using the ultrasonic and touch sensors.

Day 8

Constructing the Snatch3r Arm

Students build the Snatch3r, a robot that uses the touch and ultrasonic sensors to find objects and pick them up using a robotic arm.

Basics of Operating Systems

Students learn about the basics of what a computer's operating system does. They discuss the Linux operating system and open source software.

Linux Command Introduction

Students practice using a Linux shell to navigate the Linux file system using basic commands.

Day 9

Challenge: Line Follower

Students use the Snatch3r robot to write a program that allows the robot to follow a black line.

Challenge: Cleanup Crew Day 1

Students compete with their Snatch3r robots to see who can retrieve the most bottles from an obstacle course in a

limited amount of time.

Day 10

Challenge: Cleanup Crew Day 2

Students wrap up the Cleanup Crew challenge and compete to see who can get the highest score.

Robotics Cleanup

Students disassemble their robot, clean up their kits, and inventory the pieces they have.

Wrap Up and Review

Students go over the programming and robotics material they learned in the course.

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