

# Course Outline

## Introduction to Programming with Python

Course ID	Prerequisites	Course Duration	Lecture Hours Per Week	Lab Hours Per Week	Passing Grade
SD102	None	16 Weeks	4	4	Pass or Pass Outstanding

### COURSE DESCRIPTION

This introductory course teaches students the foundational skills of programming in the Python programming language through a three-phase process involving programming robots for simulated search and rescue operations. Phase 1) The pair programming of the Karel Robot in a virtual search and rescue simulation; Phase 2) In small teams program a physical wheeled robot based on the RaspberryPi platform to complete a simulated ground-based search and rescue simulation; Phase 3) In medium sized teams program a drone to complete an air-based search and rescue simulation. At the completion of the course, students will be able to solve problems with the basic programming staples (conditions, loops, and Boolean logic), manage input and output of dynamic data (input from robotic sensors, and output to motors, consoles, and other devices), abstract problems into solvable, programmable chunks and apply the best practices of general programming style and code documentation.

### COURSE MATERIAL/TEXT/RESOURCES:

Title	Edition/Date	Author	Publisher	ISBN
Python Fundamentals	2019	Paul J. Deitel	Pearson	N/A

\*Course material is accessible through the O'Reilly online learning platform.

## LEARNING OUTCOMES

### Module 1: Programming the Karel Robot for Virtual Search and Rescue

**Description:** In this module students begin to write their very first computer programs in the context of a notional search and rescue operation using the virtual Robot Karel. Karel functions on a 2D grid of arbitrary size which contains a variety of objects and obstacles. Students must program the behavior of Karel to search through a virtual burning building to find a missing person and report that location to the notional fire department.

#	Learning Outcomes (Mastery Skills):	ACHIEVEMENT
1	Present in a technical briefing a generalized plain English solution to a notional search and rescue situation using the Karel search and rescue robot.	Fail, Pass, Pass Outstanding
2	Develop a pseudo-code solution to the generalized case of a notional search and rescue situation using the Karel search and rescue robot.	Fail, Pass, Pass Outstanding
3	Develop and test software (using variables, type casts, I/O, control statements, functions, sequences, and dictionaries appropriate) for the Karel search and rescue robot which is able in every case to locate a fictional victim in the search and rescue simulation.	Fail, Pass, Pass Outstanding
4	Present a detailed technical overview of a software solution to the Karel search and rescue scenario which demonstrates proficiency in applying variables, type casts, I/O, control statements, functions, sequences, and dictionaries.	Fail, Pass, Pass Outstanding

**\*Passing this module requires at least a pass on all Learning Outcomes (Mastery Skills). A Pass Outstanding is awarded where student achieves a Pass Outstanding on at least 50% of the Learning Outcomes (Mastery Skills).**



## Module 2: Programming a wheeled RaspberryPi based Robot for as Search and Rescue Simulation

**Description:** In this module, students work with a wheeled Robot based on the RaspberryPi platform. Students will work in small development teams to program the wheeled robot for a search and rescue simulation. The simulation itself will be a physical obstacle course set up for the robot to traverse.

#	Learning Outcomes (Mastery Skills):	ACHIEVEMENT
1	Present in a technical briefing a generalized plain English solution to a notional search and rescue situation using a wheeled search and rescue robot based on the RaspberryPi platform.	Fail, Pass, Pass Outstanding
2	Develop a pseudo-code solution to the generalized case of a wheeled robot in the search and rescue simulation.	Fail, Pass, Pass Outstanding
3	Develop and test a piece of software (using the knowledge from module one plus: strings, files and exceptions, parsing and the robotics API) for the RaspberryPi wheeled search and rescue robot, which is able in every case to locate a fictional victim in the search and rescue simulation.	Fail, Pass, Pass Outstanding
4	Present a detailed technical overview of your software solution to the wheeled RaspberryPi search and rescue scenario, which demonstrates proficiency in applying the knowledge from module one plus: strings, files and exceptions, parsing and the robotics API.	Fail, Pass, Pass Outstanding

**\*Passing this module requires at least a pass on all Learning Outcomes (Mastery Skills). A Pass Outstanding is awarded where student achieves a Pass Outstanding on at least 50% of the Learning Outcomes (Mastery Skills).**



### Module 3: Programming an Aerial Drone-based Robot for a Search and Rescue Simulation

**Description:** In this module, students will work in medium sized development teams to program an aerial drone for a search and rescue simulation. The course concludes with teams competing in a physical obstacle course with their drones.

#	Learning Outcomes (Mastery Skills):	ACHIEVEMENT
1	Present in a technical briefing a generalized plain English solution to a notional search and rescue situation using an aerial drone search and rescue robot.	Fail, Pass, Pass Outstanding
2	Develop a pseudo-code solution to the generalized case of an aerial drone in the search and rescue simulation.	Fail, Pass, Pass Outstanding
3	Develop and test a piece of software (using the knowledge from modules one and two applied to the new aerial context) for the aerial drone search and rescue robot, which is able in every case to locate a fictional victim in the search and rescue simulation.	Fail, Pass, Pass Outstanding
4	Present a detailed technical overview of your software solution to the aerial robot search and rescue scenario, which demonstrates proficiency in applying the knowledge from modules one and two in the new context.	Fail, Pass, Pass Outstanding

**\*Passing this module requires at least a pass on all Learning Outcomes (Mastery Skills). A Pass Outstanding is awarded where student achieves a Pass Outstanding on at least 50% of the Learning Outcomes (Mastery Skills).**

### STUDENT PROGRESS AND ASSESMENT

ASSESSMENT	ACHIEVEMENT
Module 1 Learning Outcomes (Mastery Skills)	Fail, Pass, Pass Outstanding
Module 2 Learning Outcomes (Mastery Skills)	Fail, Pass, Pass Outstanding
Module 3 Learning Outcomes (Mastery Skills)	Fail, Pass, Pass Outstanding

**\*Passing this course requires at least a pass on all modules. A Pass Outstanding in the course is awarded where the student achieves a Pass Outstanding on all modules.**

