ROBO-GEEK COURSES

RG-120: Intro to Coding Python

This course is especially designed for young coders making the transition from blocks type coding to scripts type coding using Python. Our lessons are designed for students to learn fundamentals coding while building confidence in their abilities to troubleshoot and work with more complex code.
Pre-requisite: 10 WPM typing speed, ability to follow instructions online.

RG-200: Intermediate Coding Python

Students will be introduced to Python programming language. Python is a high-level programming language used in many universities and work institutions. Python is powerful and fast, yet friendly and easy to understand. Students will learn the fundamentals of coding using Python Turtle.
Pre-requisite: RG-120

RG-250: Game Programming Intro

Students will learn step by step how to develop a working 2D game from designing characters, game rules and developing multiple game levels. In this course students will be introduced to Object Oriented Programming using Python Pygame.
Pre-requisite: RG-200

RG-280: Game Programming Advanced

Students will develop a multi-level game using Pygame using Object Oriented Programming integrating all the concepts learned in RG-250

Pre-requisite: RG-250

RG-300: Intro to Arduino

Students will learn coding in C with Arduino Uno Board in Virtual Breadboard Simulator; working with digital interfaces to control different arrays of LEDs. Moreover, students will learn basic concepts of Electronics and Electricity through experimentation and hands-on activities including building of circuits on breadboards.
Pre-requisite: RG-280

RG-350: Arduino Advanced

Working with simulators is a fundamental skill required in Engineering to develop troubleshooting and collaboration skills. Moreover simulators help students develop discipline to conduct tests prior to prototyping. We selected Virtual Breadboard for this purpose. In addition can continue practicing at home as they will have their own accounts. **Pre-requisite**: RG-300

ROBO-GEEK COURSES

RG-450: Intro to Computer Vision

In this course, students will learn about the foundations of Computer Vision using Python OpenCV. This course is fundamental to prepare students for more difficult and concepts in robotics and machine learning.

Pre-requisite: RG-350

RG-460: Intermediate Computer Vision

In this course students learn how to apply advanced algorithms using OpenCV for image processing including shape detection, object detection, contour detection, template matching and morphological transformations.

Pre-requisite: RG-450

RG-480: Advanced Computer Vision

This course teaches students practical applications of computer vision in robotics and mobile applications such as quick object detection and augmented reality.

Pre-requisite: RG-460

RG-500: Robotics and Computer Vision

This course teaches students practical applications of computer vision in robotics and mobile applications such as homography and Delaunay Triangulation. Last part of the course focuses on integration with the application of AI to play checkers.

Pre-requisite: RG-480

RG-520: Robotics Path Planning

Working with the algorithms developed by **PythonRobotics**, students learn about the complexities of robotics path planning. These algorithms are essential tools for mobile robots and self driving cars.

Pre-requisite: RG-500

RG-550: Robotics Path Tracking, Mapping and SLAM

Students will work with algorithms developed by **PythonRobotics,** learning about the complexities of robotics path tracking, mapping and SLAM.

Pre-requisite: RG-520.

ROBO-GEEK COURSES

RG-580: Practical Computer Vision in Robotics

This course teaches students practical applications in computer vision in Robotics. From using QR Codes to advanced 3D reconstruction using StereoVision and Machine Learning.
Pre-requisite: RG-550

RG-600: Robotics Intro to PyBullet & Inverse Kinematics

Students will learn about PyBullet - physics simulator used extensively in research and industry. The first part of the course aims to familiarize students with PyBullet Environment. In second half Inverse Kinematics are introduced using PyBullet and algorithms from PythonRobotics.
Pre-requisite: RG-580

RG-620: PyBullet & Inverse Kinematics & Motor Control

This course teaches students practical implementations of Inverse Kinematics using PyBullet including quadruped robots, advanced robotic arms and robotic hands. Students also connect to Ubuntu servers to test robotics simulators with powerful GPUs. Finally students learn how to apply motor controls using a simple race car. **Pre-requisite:** RG-600

RG-650: PyBullet Advanced Robotics Applications

This course introduces the most advanced robots today including Delta Robot, Cassie biped robot, Boston Dynamics Atlas humanoid robot, NAO and Pepper robots using PyBullet simulator. The author of the code is Erwin Coumans, top researcher at Google Brain.
Pre-requisite: RG-620

RG-680: Intro to Machine Learning

This course introduces practical Machine Learning. Students will use Google Colab Notebooks with access to GPU and TPUs. Students will learn how to develop solutions for Machine Learning to Computer Vision for classification of handwritten digits; as well learn the application of linear regression algorithms and explore effective use of decision trees.
Pre-requisite: RG-650

RG-690: Intro to Machine Learning II

This course builds on RG-680 concepts and introduces examples from many sources including OpenCV, SciKit Learn, Keras, Tensorflow and Pytorch tutorials and from Michael Beyeler's book: Machine Learning for OpenCV. Students will use Google Colab Notebooks with access to GPU and TPUs. Students will get acquainted with neural networks and Deep Learning.
Pre-requisite: RG-680

ROBO-GEEK COURSES

RG-700: Advanced Coding: JAVA

Students will learn fundamentals of Java, type of variables, statements and operators, arrays, methods, and control structures.

Pre-requisite: RG-690

RG-710: Advanced JAVA

This course will expand Object-oriented programming System (OOPs) concepts. We will cover each and every feature of OOPs in detail : Abstraction, Encapsulation, Inheritance and Polymorphisms. The section for Input /Output has included here too.

Pre-requisite: RG-700

RG-720: Android Studio with Tablets

Android Studio is a powerful tool based on Java. Students will learn how to work with API (Application Programming Interfaces), Project Structure, gradle, libraries, methods, onCreate() method, MainActivity and XML Layout. Students will learn how to create Apps for Android Tablets using Android Studio.

Pre-requisite: RG-710

RG-750: Intro to C++

This course focuses on building practical skills on C++ in preparation for the advanced Robotics courses. From the basics to Object Oriented Programming (OOP) students will learn hands on how to work with C++ standard libraries.

Pre-requisite: RG-690 or RG-720 preferred

RG-780: Intermediate C++

This course focuses on building practical skills on C++ in preparation for the advanced Robotics courses. This course will cover: Vectors, Structs, Classes, Pointers and References using C++ standard libraries.

Pre-requisite: RG-750

RG-800: Advanced C++

This course focuses on building practical skills on C++ in preparation for the advanced Robotics courses. This course will cover Dynamic Variables, Classes and Structs, OOP Advanced Principles, Exception Handling and CMake platform using C++ standard libraries. **Pre-requisite**: RG-780

ROBO-GEEK COURSES

RG-820: Robotic Manipulation

This course studies the use of robotics manipulators from simple pick and place robots to using geometric pose estimation to locate objects. The content is based on the book Robotics Manipulation from Dr. Russ Tedrake from MIT

Pre-requisite: RG-710 or RG-800 preferred

RG-850: Robotic Manipulation Advanced

This course studies the use of robotics manipulators using practical applications such bin picking, object detection and segmentation, force control, motion planning and a taste of using reinforcement learning. The content is based on the book Robotics Manipulation from Dr. Russ Tedrake from MIT

Pre-requisite: RG-820

RG-880: Computer Vision with Deep Learning

This course will go in depth of deep learning architecture use in Computer Vision including object detection, image segmentation, Mask RCNN and the application of YOLO.

Pre-requisite: RG-850

RG-900: Computer Vision with Deep Learning II

This course builds on RG-900 and further explores advanced architectures use in Computer Vision with Deep Learning including in depth discussion of DeepSort, Detectron2, EfficientDet, Image Captioning and Segmentation, AlphaPose and OpenPose.

Pre-requisite: RG-880

RG-920: Reinforcement Learning

This course is in an introduction to fascinating topic of Reinforcement learning in Robotics. Students will learn about OpenAI Gym framework, how to interact with PyBulllet, Q-learning with Keras. Finally applications with Keras and PyBullet.

Pre-requisite: RG-900