

ROBO-GEEK COURSES



LEVEL 1: Coding Basics

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-220: STEM + Python Turtle

Students will learn about three STEM subjects: Solar System, Bridge Building and Gravity. For each subject, students will create programs in Python to simulate and demonstrate understanding. This course is based on the material developed in our STEM Club.

Pre-requisite: RG-200

LEVEL 2: Coding & Electronics

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 or RG-220

RG-250: 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-250 or RG-280

RG-300: 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

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LEVEL 3: Computer Vision & Robotics

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-280 or 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. This algorithms are essential tools for mobile robots and self driving cars.

Pre-requisite: RG-500

RG-550: Intro to Self Driving Car

In this course, students will learn fundamentals of Self Driving cars using Python OpenCV from detecting cars, traffic lights and lane detection.

Pre-requisite: RG-500 or RG-520 preferred.

RG-600: Advanced Robotics ROS I

Students will learn Unix commands, scripts and editors in Ubuntu 16.0 and the fundamentals of ROS (Robot Operating System), ROS packages, manifests, ROS nodes and topics and messages. Libraries covered Turtlesim and TurtleBot 2.

Pre-requisite: RG-550

RG-650: Advanced Robotics ROS II

Students will learn about different kind of robots in ROS: Turtlebot 3. Then students will create and build ROS packages, will create a Robot and add the wheels and Robot Design. Robots will be simulated in Gazebo.

Pre-requisite: RG-600

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LEVEL 4: Machine Learning & Advanced Coding

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

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-600 or RG-650

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: Android Studio with Sanbot ELF

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 in RG-720. In RG-750 students will learn how to use the different managers to control Sanbot Elf robot.

Pre-requisite: RG-720

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LEVEL 5: Deep Learning & Advanced Robotics

RG-800: 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-720 or RG-750 preferred

RG-850: Advanced Robotics ROS III

Students will learn Robot Design using Xacro Files in ROS Noetic using Ubuntu 20.04. With hands on exercises in Python and C++, students will learn Kinematics with practical exercises with simulation of Robotics Arms.

Pre-requisite: RG-750 or RG-680

RG-880: Advanced Robotics ROS IV

Students will work inside ROS to communicate RPI with client. Students will use C++ and Python code to subscribe and publish their cameras while connecting with a Raspberry Pi (RPI) hardware.

Pre-requisite: RG-850 and Raspeberry Pi 3+ required

RG-900: 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 or RG-880 preferred

RG-950: 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-900

RG-950: 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 PyBullet, Q-learning with Keras. Finally applications with Keras and PyBullet.

Pre-requisite: RG-850, RG-900 or RG-920 preferred