ROBO-GEEK AI Courses

LEVEL 1: Coding Basics

RG-120: Introduction to Python for Young Coders

This course is for young coders transitioning from block coding to script-type coding using Python. The course covers the fundamentals of coding while building confidence in students' abilities to troubleshoot and work with more complex code.
Prerequisites:

- **Typing speed of at least 10 WPM.**
- **Ability to follow instructions online.**

RG-200: Intermediate Coding Python

This course is for students who have completed RG-120 and are ready to modify and troubleshoot complex Python programs that use lists, strings, loops, and conditional commands. The course covers advanced topics such as binding events with keys, recursion, nested loops, and drawing with polygons.
Prerequisites:
Successful completion of RG-120

RG-250: Game Programming Intro

This course teaches students how to develop a 2D game from scratch. They will design characters, create game rules, and build multiple game levels. Students will use Python Pygame to code with Object Oriented Programming.
Pre-requisite: RG-200

LEVEL 2: Coding & Electronics

RG-280: Game Programming Advanced

In this course, students will develop a multi-level game using Pygame and Object-Oriented Programming. They will incorporate all the concepts learned in RG-250.

Pre-requisite: RG-250

RG-300: Intro to Arduino

In this course, students will learn coding in C with Arduino Uno Board in a Virtual Breadboard Simulator. They will work 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 circuits on breadboards.
.**Pre-requisite**: RG-280

RG-350: Arduino Advanced

In this course, students will learn how to work with simulators, a fundamental skill required in Engineering to develop troubleshooting and collaboration skills. They will also learn how to conduct tests before prototyping, which helps them build discipline. Virtual Breadboard is the simulator of choice for this course.
This course has a pre-requisite of 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 training students in complex coding used in robotics and machine learning.
Pre-requisite: RG-350

RG-460: Intermediate Computer Vision

In this course, students will learn how to apply advanced algorithms for image processing, including shape detection, object detection, contour detection, template matching, and morphological transformations.
Pre-requisite: RG-450

RG-480: Advanced Computer Vision

In this course, students will learn practical computer vision applications in robotics and mobile applications, such as quick object detection and augmented reality.

Pre-requisite: RG-460

RG-500: Robotics and Computer Vision

In this course, students will learn practical applications of computer vision in robotics and mobile applications, such as Homography and Delaunay Triangulation. They will also learn algorithms for road sign recognition, optical flow refresher, and Background Subtraction **Pre-requisite**: RG-480

RG-520: Robotics Path Planning

In this course, students will learn about the complexities of robotics path planning using algorithms developed by PythonRobotics. These algorithms are essential tools for mobile robots and self-driving cars.
This course has a **pre-requisite of RG-500**.

RG-550: Robotics Path Tracking, Mapping and SLAM

In this course, students will work with algorithms developed by PythonRobotics to learn 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.
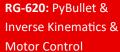**Pre-requisite**: RG-550

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.
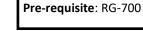**Pre-requisite**: RG-680

ROBO-GEEK COURSES

RG-700: Advanced Coding: JAVA BASIC

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

This course teaches students how to use Android Studio to manage their Java code. Students will learn about the API (Application Programming Interfaces), project structure, Gradle, libraries, and methods. They will also learn how to write Java code with MainActivity and XML Layout modules. Finally, 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++

In this course, students will build practical skills in C++ in preparation for advanced Robotics courses and Game Programming with Epic Games. The course will cover Vectors, Structs, Classes, Pointers, and References using C++ standard libraries.

Pre-requisite: RG-750

RG-800: Advanced C++

This course is designed to build practical skills in C++ in preparation for advanced Gaming courses. Students will learn about Dynamic Variables, Classes and Structs, OOP Advanced Principles, Exception Handling, and the 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

ROBO-GEEK Game Programming

LEVEL 7: Advanced Game Programming

RG-805:
Epic Games I

This course is an introduction to Epic Games using UE5. It will cover the UE5 installation, Lyra Game Installation, Intro to Blueprints, and Intro to Animation with Metahumans.

Pre-requisite: RG-800

RG-810:
Epic Games II

This course uses the Lyra Starter Game. Students will create a new Experience and a game mode. They will utilize the Geometry Scripting Tool to create New Levels in Lyra Game.

Pre-requisite: RG-805

RG-815:
Epic Games III

This course will cover the second stage of creating a new Level and creating a New Weapon using the Lyra Game. Students will install VS 2022 with C++; they will learn C++ Coding Standard use in UE5. They will develop their First Actor with C++ and Meta sounds.

Pre-requisite: RG-810

RG-820:
Epic Games IV

In this course, the students will work with an Epic Games Tutorial that uses a basic input system using the First-Person Template and the Enhanced Input System. The students will learn how to set up native gameplay tags and how to use them to configure input bindings in the editor with C++.

Pre-requisite: RG-815

RG-825:
Epic Games V

In this course, the students will learn about Game Design, Game Engines, Gameplay scripting, Level Design, Content Pipelines, and Developing AI Games with C++ in Epic Games.

Pre-requisite: RG-820

RG-830:
Epic Games VI

In this course, the students will learn about Developing a Team, Optimizing and Debugging, User Interfaces, Native Programming, Shipping and Releasing, and Game Marketing with C++ in Epic Games.

Pre-requisite: RG-825

ROBO-GEEK AI COURSES

RG-1000: Principles and Applications of Electricity I

This course evaluates the social, environmental, and economic effects of electricity production and consumption, and suggests methods for achieving sustainable practices. It identifies the components of a direct current (DC) circuit and explains their functions. It investigates the relationship between current (I), resistance (R) and the voltage (V).

RG-1010: Principles and Applications of Electricity II

This course explores the fundamental nature of electric charges and describes the properties of static and current electricity. It applies mathematical models to represent current (I), voltage (V), and resistance (R). It constructs series and parallel circuits to calculate different values. Additionally, it determines the efficiency of various electrical devices that consume or produce electrical energy.

AI-2000: Intro to AI (Artificial Intelligence)

This course provides a foundational understanding of Artificial Intelligence (AI), focusing on Python programming and machine learning concepts. Students will gain hands-on experience using Colab Notebooks and explore real-world applications of AI. (6 weeks)

AI-2010: Intermediate AI (Artificial Intelligence)

This course aims to comprehensively understand deep learning, emphasizing practical application using TensorFlow and Colab Notebooks. Students will build a solid foundation in Python programming and delve into advanced TensorFlow techniques. (6 weeks)

AI-2020: Advanced AI (Artificial Intelligence)

Master computer vision and natural language processing. Learn image processing, object detection, NLP fundamentals, and advanced models. Hands-on with Google Cloud APIs. Explore LLMs, ethics, and future trends. (12 weeks)