



3-Month Internship Program

(12 Weeks): Robotics Training

Week 1: Introduction to Robotics and Robot Components

- **Topics:**
 - Overview of robotics and its applications in various industries.
 - Basic components of a robot: Sensors, actuators, control systems, and power supply.
 - Introduction to types of robots: Industrial, mobile, autonomous, humanoid.
 - Understanding the role of microcontrollers (Arduino, Raspberry Pi).
- **Assignment:**
 - Research and present the history of robotics and the evolution of robot components.

Week 2: Introduction to Arduino and Raspberry Pi

- **Topics:**
 - Introduction to Arduino and Raspberry Pi for robotics applications.
 - Setting up and configuring an Arduino board and Raspberry Pi.
 - Programming basics using Arduino IDE and Python for Raspberry Pi.
 - Basic input/output operations: Reading sensors and controlling actuators.
- **Assignment:**
 - Create a simple circuit using Arduino to control an LED, or use Raspberry Pi to control a motor.

Week 3: Sensors and Actuators in Robotics

- **Topics:**
 - Overview of various sensors used in robotics: Ultrasonic, infrared, gyroscope, accelerometer, cameras.
 - Types of actuators: Motors (DC, Servo, Stepper), solenoids, pneumatic actuators.
 - Understanding sensor data and interfacing sensors with microcontrollers.
 - Actuating movement: Controlling motors for robot movement.
- **Assignment:**
 - Build a basic robot that uses an ultrasonic sensor to avoid obstacles.



Week 4: Motor Control and Robotics Kinematics

- **Topics:**

- **Motor control techniques: PWM (Pulse Width Modulation) for speed control, H-Bridge for direction control.**
- **Introduction to kinematics in robotics: Forward and inverse kinematics.**
- **Understanding robot motion and path planning.**
- **Basic algorithms for moving robots in specific directions.**

- **Assignment:**

- **Design and implement a robot to move forward, backward, and turn using motor control.**

Week 5: Introduction to Robotics Programming (C/C++ and Python)

- **Topics:**

- **Programming fundamentals for robotics: C/C++ and Python for embedded systems.**
- **Writing basic control algorithms for robots.**
- **Libraries for controlling robots: Arduino libraries, Raspberry Pi libraries, ROS (Robot Operating System).**
- **Understanding real-time control and multithreading in robotics.**

- **Assignment:**

- **Write a simple Python or C/C++ program to control a robot's motion based on sensor input.**

Week 6: Robotics Control Systems

- **Topics:**

- **Introduction to control systems: Open-loop and closed-loop systems.**
- **Understanding feedback systems: PID (Proportional-Integral-Derivative) control.**
- **Application of PID control in robotics for precise movement.**
- **Implementing basic control algorithms to stabilize robot movement.**

- **Assignment:**

- **Implement a basic PID controller to control the speed and position of a robot.**



Week 7: Autonomous Robotics and Path Planning

- **Topics:**

- Introduction to autonomous robots: Sensors, decision-making, and control systems.
- Path planning algorithms: A*, Dijkstra's algorithm, and reactive path planning.
- Introduction to Simultaneous Localization and Mapping (SLAM).
- Mapping environments using LIDAR and visual sensors.

- **Assignment:**

- Implement an autonomous robot that can navigate through a maze using basic path planning techniques.

Week 8: Robot Vision and Image Processing

- **Topics:**

- Introduction to computer vision and image processing in robotics.
- Using cameras and image processing libraries (OpenCV) for object detection and recognition.
- Applying machine learning for object tracking and classification.
- Understanding basic image filtering techniques and edge detection.

- **Assignment:**

- Develop a simple robot vision system to detect and track objects using a camera.

Week 9: Introduction to ROS (Robot Operating System)

- **Topics:**

- Understanding ROS and its role in robot development.
- Setting up and configuring ROS on Ubuntu.
- Topics in ROS: Nodes, Topics, Messages, Services, and Actions.
- Writing ROS-based programs for controlling robots and managing data.

- **Assignment:**

- Create a simple ROS node to control robot movement and communicate between nodes.



Week 10: Communication in Robotics: Bluetooth and Wi-Fi

- **Topics:**

- **Introduction to communication methods in robotics: Bluetooth, Wi-Fi, Zigbee.**
- **Setting up communication between a robot and a remote control system.**
- **Using mobile apps or computers to control robots via wireless communication.**
- **Remote monitoring of robot status and sensors using communication protocols.**

- **Assignment:**

- **Develop a Bluetooth-controlled robot or create a Wi-Fi-based robot control system.**

Week 11: Advanced Robotics Topics (AI and Machine Learning in Robotics)

- **Topics:**

- **Introduction to artificial intelligence (AI) and machine learning (ML) in robotics.**
- **Using AI for decision-making, path planning, and object recognition in robotics.**
- **Introduction to reinforcement learning in autonomous robotics.**
- **Neural networks and deep learning for advanced robotics applications.**

- **Assignment:**

- **Implement a simple machine learning algorithm (e.g., decision tree) for a robot's decision-making process.**



Week 12: Final Project and Review

- **Topics:**

- **Applying all robotics concepts to a final project.**
- **Integrating sensors, actuators, and control systems in a working robot.**
- **Testing and debugging the robot's performance in different environments.**
- **Final project presentation and review.**

- **Assignment:**

- **Develop a fully functional robot for a specific task (e.g., object picking, line following, or autonomous navigation). Present the project with a working demonstration and explanation of the design and algorithms used.**

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