Robotics and Automation

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title and Code	Credits	Credit distribution of the course			Eligibility Criteria	Prerequisite of the Course (if any)
		Lecture	Tutorial	Practical/Practice		
Robotics and Automation	2	0	0	2	Class XII	Any Programming Language

1. Learning Objectives

After completion of this course students would be aware of Robotics and the concept of using a microcontroller to program the Robot. They would be able to use various sensors and make microcontroller respond to the external environment. Student would be in a position to make rudimentary robot which is capable of moving along a predetermined path, follow a drawn line and equivalent applications. They would be able to make a robotic arm capable of Picking and Placing the objects.

2. Learning Outcomes

At the end of this course, Students will be able to

1. Understand the basic Components used in robotics in various industries.
2. Understand the hardware platforms and their programming environments used in robotics applications.
3. Understand the working of sensors, actuators and other components used in design and Implementation of robotics
4. Develop a moving robot and robotic arm.

3. Main Course Structure

Unit I

>   **Introduction to Robotics:** Defining Robotics, Laws of Robotics, History of Robotics, different types of robots, Components of Robot, Applications of Robotics in Health care, Automobile industry and Domestic, and logistics.

Unit II

>   **Hardware and Programming Platforms of Robotics:** Microcontrollers, Arduino, Raspberry Pi etc, Programming Environments Integrated Development Environment (IDE)

Unit III

Sensors, Actuators and Grippers: PIR sensors, Sound Sensors, Vision Sensor, Gyroscope and Accelerometer, Magnetometer etc, Actuators like DC Motors, Servo Motors, Stepper motors, Motor Control, Grippers

Unit IV

Robotic Arms/ Manipulators: Understanding Manipulator Kinematics, Joints and Links, Type of Joints, Degree of Freedom, Manipulator dynamics.

PRACTICALS

1. Programming the hardware platform with sensor and record the values for different environments on serial monitor.
2. Programming the hardware platform with Actuators and visualize the motion produced.
3. Programming the hardware platform with indictors like LCD, LED, Buzzers.
4. Construct a simple Line following Robot.
5. Construct a line following robot with Obstacle Detection and Indicating the presence of obstacle.
6. Designing a simple Robotic Arm and programming it for picking and placing of objects

4. **Teaching Methodology/Activities in the classroom**

   1. Depiction of usage of robotics in Health care and Automobile industry through Videos.
   2. Grouping of Interdisciplinary students for one project since robotics is itself an interdisciplinary field with knowledge required from mechanical, electronics and well as computer science domains.
   3. Hands on practical session
   4. Visit to an industry to visualize the implementation of robotics in India.

5. **Assessment Pattern for each Unit/practical. Component of Attendance in the Assessment of 1 credit theory course**

S. No.	Assessment Method	Marks
1	Quiz	10

2	Presentation on recent advancements/ Future / Challenges of robotics in India	10
3	Practical Completion	50
4	Extra Project Implementation	10
	TOTAL	**80**

6. Mapping with the next suggestive course

Advanced Robotics for automation

IoT and its application

7. Prospective Job Roles after a particular course

Robotic engineer

Robot Operator

Robotics Programmer

Mechatronics Engineer

8. Essential Reading

1. Saha, S.K., Introduction to Robotics, 2nd Edition, McGraw-Hill Education, New Delhi, 2014
2. R.K. Mittal, I.J. Nagrath, ―Robotics & Control, Tata McGraw & Hills, 2005.

9. Suggestive Reading

1) Robotic Engineering – An Integrated Approach by Richard D Klafter, Thomas A. Chmielewski and Michael Negin, Prentice Hall India (1989)
2) Saeed B. Niku, Introduction to Robotics, Analysis, systems and Applications, PHI (2007)