Suggestive readings

1. Algorithm: Synthesis and Applications, PHI Learning Pvt. Ltd., 2003, 1st Edition.
2. Martin T. Hagan, Howard B. Demuth, Mark H. Beale, Neural Network Design,PWS Publishing Company, Thomson Learning, 1st Edition 4. N.P. Padhy, Artificial Intelligence and Intelligent Systems, Oxford University Press, 1st Edition

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time

GENERIC ELECTIVE COURSE-: Robotics (INGE8A)

Credit distribution, Eligibility and Pre-requisites of the Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Robotics (INGE8A)	04	02	-	02	Course admission eligibility	Basic programming.

Learning Objectives

The Learning Objectives of this course are as follows:

- After completion of this course students should be well versed in programming a microcontroller.
- They should be able to use various sensors and make the microcontroller respond to the external environment.
- Students would be in a position to make a rudimentary robot which is capable of moving along a predetermined path, follow a drawn line and equivalent applications.

Learning Outcomes

After successful completion of the course, students will be able to:

- Understand the history, concepts and key components of robotics technologies.
- Understand the control systems related to robotics.
- Analyze of various robot sensors, Actuators and their perception principles that enable a robot to analyses their environment

- Analyze the robot motion, kinematics, navigation and path planning.
- Design the programming principles for robot control systems.

SYLLABUS OF GE

UNIT-1 **(8 Hours)**

Introduction to Robotics: Brief history of robotics, future perspectives of robotics, classification of robots,basic components of robot, Degrees of freedom of robots, Robot configurations and concept of workspace, human system and robotics, safety measures in robotics, social impact, advantages and disadvantages of robots, Robotics applications **.**

UNIT-2 **(8 Hours)**

Basic components for Robotic Applications

Actuators: DC Motors, Gearing and Efficiency, Servo Motors, Stepper motors, Motor Control and its implementations

Sensors: Sound Sensor, Gas Sensor, Ultrasonic Sensor, IR Sensor, LDR, Temperature Sensor, PIR Sensor, contact Sensor, Proximity sensor , pressure sensor .

Indicators: LCD, LEDs, Buzzer, Relays

UNIT-3 **(8 Hours)**

Programming Environments: Integrated Development Environment (IDE) for microcontrollers, free IDEs like AVR Studio, WIN AVR. Installing and configuring for Robot programming, In System Programmer (ISP), loading programs on Robot. Languages used in Robotics (Basic concept)

UNIT-4 **(6 Hours)**

Programming and interfacing . Programming Robot to follow a given path; Direction controlled movements of Robot using sensors like LDR/IR sensors and sound Sensor, Line Follower Robot. Wired RS232 (serial) Communication, Application of USART in commanding Robot using Bluetooth, WiFi modules etc.

Practical Component **(60 hours)**

Software /hardware based practicals (Microcontroller/Arduino/RobotStudio/ or any available software)

1. Program to blink LED
2. Program to display decimal numbers on Seven segment display
3. Program to interface LCD and display messages .
4. Program to interface sound sensor /IR sensors/Ultrasound sensor
5. Program to interface motors (DC/stepper/Servo).

6. Program to interface Camera/Relay
7. Buzzer interfacing
8. interfacing with Zigbee
9. Write a program to do object detection with Robots.
10. To design White line follower Robot.
11. Programming using USART.
12. Project

Essential/recommended readings

1. Saha, S.K., Introduction to Robotics, 2nd Edition, McGraw-Hill Education, 3rd Edition (2025)
2. R.K. Mittal, I.J. Nagrath, Robotics & Control, Tata McGraw & Hills, 2005. M P Groover, Industrial Robotics, Tata McGraw & Hills, 2nd Edition 2012
3. S R Deb and Sankha Deb, Robotics Technology and Flexible Automation, Tata McGraw & Hills. 2nd Edition 2017.

Suggestive readings

1. Craig. J. J, Introduction to Robotics- Mechanics and Control, Pearson Education India, 3 nd Edition. 1999

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GENERIC ELECTIVE COURSE-: Augmented and Virtual Reality (INGE8B)

Credit distribution, Eligibility and Pre-requisites of the Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Augmented and virtual reality (INGE8B)	04	02	-	02	Course admission eligibility	Basics of programming language

Learning Objectives

The Learning Objectives of this course are as follows:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies and applications with a futuristic vision along with socio-economic impact and issues.