SEMESTER S7

BASICS OF ROBOTICS & AUTOMATION

Course Code	**OEMRT721**	**CIE Marks**	40
Teaching Hours/Week (L: T:P: R)	3:0:0:0	**ESE Marks**	60
Credits	3	**Exam Hours**	2 Hrs. 30 Min.
Prerequisites (if any)	None/ (Course code)	**Course Type**	Theory

Course Objectives:

1. To provide students with a comprehensive understanding of robotics, including robot structures, classifications, sensors, end effectors, kinematics, and robotic programming, along with the basics of PLC systems and their applications.

2. To equip students with practical skills in robotic motion control, sensor integration, and PLC programming, enabling effective automation and process control in industrial and research settings.

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SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	Robotics –Introduction –Basic Structure-Classification of Robot and Robotic System-Law of Robotics-Robot Motion- Wrist Configuration-Motion – Roll –Pitch-Yaw-Drives-Hydraulic Motors-DC Motor-Stepper Motor-PowerTransmission Systems	9
2	Sensors in Robotics: Position Sensor-Potentiometer-Encoders-LVDT-Velocity Sensor-Acceleration Sensor-Force- Pressure and Torque Sensor-Touch and Tactile Sensor-Proximity –Range and Sniff Sensor-Robot End Effectors-Types of End Effectors- Mechanical Gripper – Types of Gripper Mechanism.	9
3	Position Orientation-Frames-Mapping-Changing Description from Frames to Frames. Transformation arithmetic's-Translation-rotation-transformation- transforms equations- transformation of the vectors-. Introduction to manipulations Forward Kinematics and inverse	9

	Kinematics- D-H representation-Method of Robotic Programming (Qualitative Treatment Only).	
4	Basics of PLC-Advantage- Capabilities of PLC-Architecture of PLC - Types of PLC-Types of I/O Modules- Configuring of PLC. Simple process control programme using ladder logic- PLC arithmetic functions- Timer and Counters Requirement of communication networks in PLC – Connecting PLC to computer.	**9**

Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	**15**	**10**	**10**	**40**

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End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks **(8x3 =24marks)**	• Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. **(4x9 = 36 marks)**	**60**

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Explain robot actuators and controls	**K2**
CO2	Summarize robot sensors for robotic application	**K2**
CO3	Explain the kinematics of robots and adaptive control	**K2**
CO4	Understand the basics of Programming Logic Circuits and programming Programmable Logic Circuits	**K2**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1		1								
CO2	3	2	1	2								2
CO3	3	3										
CO4	3	3	2	2								2

Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation*

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Text Books

Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Industrial Robotics- Technology, Programming and Applications	M.P Groover	McGraw-Hill USA	1986
2	Introduction to Robotics,	John Craig	Macmillan	1985
3	Process Control Instrumentation Tech	Curtis Johnson	8 TH Edition Prentice Hall	June 2005
4	Programmable Controllers	Petrezeulla	McGraw Hills	1989

Reference Books

Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Linear Integrated circuits	D Roy Choudhury and shaail B. jain	New age international Pvt.Ltd	2003
2	Mechatronics	Boltans w	Pearson Education	6th edition, published in 2023