ROBOTICS AND ITS APPLICATIONS

Course Code	19ME4701C	**Year**	IV	**Semester**	I
Course Category	Program Elective-IV	**Branch**	ME	**Course Type**	Theory
Credits	3	**L – T – P**	3 – 0 – 0	**Prerequisites**	Nil
Continuous Internal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes		**Level**
After successful completion of the course, the student will be able to		
CO1	Understand the basic anatomy of robots.	L2
CO2	Solve kinematic and dynamic problems of the robot.	L3
CO3	Develop robot program and joint trajectory for path planning.	L3
CO4	Describe working principle of various robot sensors.	L2
CO5	Outline the applications of robots in industry.	L2

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3-High, 2: Medium, 1: Low)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3					1		1				1	3	1
CO2	3	3	2									1	3	1
CO3	3	3	2									1	3	1
CO4	3											1	3	1
CO5	3					1						1	3	1

Syllabus

Unit No.	**Contents**	**Mapped COs**
I	**INTRODUCTION:** Basic concepts - Robot anatomy - classification, robot specifications and Work volume, Types of Robot actuators- Pneumatic, Hydraulic actuators, electric and stepper motors **END EFFECTORS**- types of end effectors, grippers and tools, Requirements and challenges of end effectors.	CO1
II	**TRANSFORMATIONS**- Homogeneous coordinates for translation and rotation **MANIPULATOR KINEMATICS:** D-H notation, Forward and inverse kinematics, simple problems, Dynamics- lagrangian formulation, introduction to jacobian computation.	CO2
III	**TRAJECTORY PLANNING** :Trajectory planning with cubic polynomial, blending, higher order trajectories **ROBOT PROGRAMMING:** Robot language classification - programming methods - off and on-line programming - Lead through method - Teach pendent method - VAL systems and language, simple programs.	CO3
IV	**SENSORS:** Sensor devices, Types of sensors - contact, position and displacement sensors, Force and torque sensors - Proximity and range	CO4

	sensors - acoustic sensors –slip sensors, Robot vision systems	
V	**INDUSTRIAL APPLICATIONS:** Application of robots - material handling - machine loading and unloading, assembly, inspection, welding, spray painting, **Recent Developments in Robotics:** mobile robot, microbots, safety considerations.	CO5

Learning Recourse(s)
Text Book(s)
1. Mikell P. Groover. Industrial Robotics Technology Programming and Applications, McGraw Hill Co., Singapore, 1995. 2. Robotics and Control / Mittal R K & Nagrath I J / TMH.2017
Reference books
1. Robotic Engineering by Richard D.Klafter, Prentice Hall 2. Introduction to Robotics – Saeed B.Niku, Prentice Hall 3. Introduction to Robotics – John J. Craig, Addison Wesley
e- Resources & other digital material
1. http://nptel.ac.in/downloads/112101098/ 2. https://nptel.ac.in/courses/112/105/112105249/ 3. https://nptel.ac.in/courses/107/106/107106090/