

Branch Name:	Mechanical Engineering
Program Code:	ET101
Course Name:	Fundamentals of Robotics
Course Code:	2ET1010681T
Pre-requisite Course:	Zeal to learn the subject

Course Objectives:

1. To understand and discuss the fundamental elementary concepts of Robotics.
2. To provide insight into different types of robots.
3. To explain intelligent module for robotic motion control.
4. To educate on various path planning techniques.
5. To illustrate the working of innovative robotic devices.

Teaching and Examination Scheme:

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)								
					Theory (Marks)				Practical (Marks)				Total (Marks)
	SEE		CCA		SEE		CCA						
	L	T	P	Total	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
3	3	-	-	3	24	60	16	40	-	-	-	-	100

Course Contents:

Sr. No	Topic	Total Hours	Weightage (%)
1	Introduction to Robotics: Definition, history, laws, components, classifications, specifications, safety, social impact, and future trends.	08	20
2	Robot Anatomy & Motion Analysis: Configurations, joints, degrees of freedom, movement types, work envelope, and basic kinematics.	08	20
3	Drives & End Effectors: Hydraulic, pneumatic, and electric drives; types of grippers; force analysis; robot hands; control systems.	08	20
4	Path Planning: Joint and Cartesian space techniques, polynomial use, path types, and orientation planning.	08	20
5	Robotics Applications: Industrial tasks (material handling, welding), medical, agricultural, space, unmanned vehicles, CIM, and types of robots (manipulators, humanoids, swarm, etc.).	08	20

Reference Books:

1. Robotics control, sensing, vision and intelligence, K S Fu, R C Gonzalez, CSG Lee, Tata McGraw Hill, 2008.
2. Introduction to Robotics: Analysis, Control, Applications by Saeed Niku, John Wiley & Sons., 2018
3. Introduction to Robotics by S K Saha, Tata McGraw-Hill, 2018
4. Robotics and control by R K Mittal, I J Nagrath, Tata McGraw Hill 2003.
5. Robotics Fundamental Concepts & Analysis by Ashitava Ghoshal, Oxford University Press, 2017

6. Ganesh S Hegde, Industrial Robotics, Laxmi Publications (P) Ltd, 2015
7. Mikell P. Groover, Mitchell Weiss, 'Industrial Robotics (Technology, Programming and Applications)', 2nd Edition, McGraw-Hill Education, 2016

E-Resources:

1. <https://nptel.ac.in/courses/112105249>

Course Learning Outcomes (CLO):

CLO	Description	Bloom's Taxonomy Level
CLO 1	Understand the fundamentals, history, and societal impact of robotics and automation.	1 Remembering 2 Understanding
CLO 2	Identify and describe robot anatomy, configurations, joints, and degrees of freedom.	2 Understanding 3 Applying
CLO 3	Analyze robotic movements and solve basic kinematic problems.	4 Analyze
CLO 4	Select appropriate drive systems and end-effectors for various robotic applications	3 Applying 4 Analyze
CLO 5	Apply path planning techniques to design robot trajectories in joint and Cartesian spaces.	3 Applying 4 Analyze
CLO 6	Evaluate the use of robots in industrial, medical, agricultural, space, and autonomous applications.	5 Evaluating 6 Creating

Mapping of CLOs with POs & PSOs:

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CLO1	M		M			M						L	M	M
CLO2		H	M			M	M					L	M	L
CLO3	M	H	M	M		M	M					L	M	L
CLO4	H	M	M	M	M								M	
CLO5	H	L	M										L	

H: High, M: Medium, L: Low