



**C. U. SHAH UNIVERSITY**  
**Wadhwan City**

**FACULTY OF:** - Technology & Engineering  
**DEPARTMENT OF:** - Automobile Engineering  
**SEMESTER:** - VIII  
**CODE:** - 4TE08IRO1  
**NAME** – Industrial Robotics

**Teaching & Evaluation Scheme:-**

Subject Code	Name of the Subject	Teaching Scheme (Hours)				Credits	Evaluation Scheme							
		Th	Tu	Pr	Total		Theory				Practical (Marks)			Total
							Sessional Exam		University Exam		Internal		University	
							Marks	Hrs	Marks	Hrs	Pr/Viva	TW	Pr	
4TE08IRO1	Industrial Robotics	3	0	2	5	4	30	1.5	70	3	---	20	30	150

**Objectives:-**

1. To introduce the basic concepts, parts of robots and types of robots.
2. To learn about analyzing robot kinematics and robot programming.
3. To discuss about the various applications of robots, justification and implementation of robot.
4. To make the student familiar with the various drive systems for robot, sensors and their applications in robots and programming of robots.

**Prerequisites:** - Basic Knowledge of mathematics and Kinematics.

**Course outline:-**

Sr. No.	Course Contents	Hours
1	<b>Fundamentals of Robot:</b> Robot – Definition – Robot anatomy – Co-ordinate systems, work envelope, types and classification – Specifications – Pitch, yaw, roll, joint notations, speed of motion and pay load – Robot parts and their functions – Need for robots – Different applications.	08
2	<b>Robot Drive Systems:</b> Types of drive systems – D.C. servo motors, stepper motor and A.C. servo motors – Salient features, applications and comparison of all these drives.	06
3	<b>Robot Kinematics:</b> Direct and Inverse Kinematics, Co-ordinate Transformation – Brief Robot Dynamics	06
4	<b>End Effectors:</b> Types of End effectors – Grippers – Tool as end effectors – Selection and design considerations.	06
5	<b>Sensing And Machine Vision:</b> Requirements of a sensor – Position sensors – Range sensors – Proximity sensors – Touch sensors – Force and Torque Sensors –	08

	Introduction to Machine Vision – Functions and Applications.	
7	<b>Robot Programming:</b> Methods – Languages –programming for pick and place applications-palletizing. Capabilities and Limitation – Artificial Intelligence – Knowledge Representation – Search Techniques – AI and Robotics.	<b>05</b>
8	<b>Robot Cell Design And Applications:</b> Robot cell design-types and control. Applications of Robots –process applications in welding and painting – Assembly applications– Material Handling applications.	<b>06</b>

**Learning Outcomes:** Students will be able to...

The Student must be able to design automatic manufacturing cells with robotic control using the principle behind robotic drive system, end effectors, sensor, machine vision, robot kinematics and programming.

**Text Books:**

1. Robotic Engineering – An Integrated Approach by **Richard D Klaffer, Thomas A Chmielewski, Michael Negin** – PHI.
2. Robotics control, Sensing, Vision and Intelligence by **Fu, K.S., Gonzalez, R.C. and Lee, C.S.G.**, Mc-Graw Hill, 1987.
3. Industrial Robotics – Technology, Programming and Applications by **M.P. Groover**, McGraw-Hill, USA, 1986.
4. Robotics Fundamental concepts and Analysis by **A. Ghosal**, Oxford University Press India. 2006

**References Books:**

1. Robotics Technology and Flexible Automation by **S.R.Deb**, Tata McGraw Hill-2009.
2. Introduction to Robotics: Analysis, Systems, Applications by **Saeed B. Niku**, 2nd edition, Pearson Education India, PHI 2003 (ISBN 81-7808-677-8)
3. Introduction to Robotics, Mechanics and Control by **John J Craig**, Pearson Education.
4. Fundamentals of Robotics – Analysis and Control by **Robert J Schilling**, PHI.
5. Industrial Robots by **Ganesh S Hegde** – Laxmi Publications.
6. Robotics and Image Processing by **P.A. Janaki Raman**, Tata McGraw-Hill, 1991.
7. Robotics and control by **R.K.Mittal and I.J.Nagrath** , Tata Mcgraw hill ,2003
8. A Robot Engg text book by **Mohseen Shahinpoor**, Harper and Row Publishers, NY