GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code:3164105
Semester – VI
Subject Name: Industrial Robotics and Material Handling Systems

Type of course: Professional Elective Course

Prerequisite: Zeal to learn the course

Rationale: Industrial Robotics and material Handling System is one of the best concepts in the field of industrial work. The concepts of application of robotics and automated handling systems are vitally important to the robotics and automation engineer..

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1	**Introduction:** Types of industrial robots, Load handling capacity, general considerations in Robotic material handling, material transfer, machine loading and unloading, CNC machine tool loading, Robot centered cell.	7
2	**Robots For Inspection :** Robotic vision systems, image representation, object recognition and categorization, depth measurement, image data compression, visual inspection, software considerations.	8
3	**Other Applications:** Application of Robots in continuous arc welding, Spot welding, Spray painting, assembly operation, cleaning, robot for underwater applications.	8
4	**End Effectors:** Gripper force analysis and gripper design, design of multiple degrees of freedom, active and passive grippers. SELECTION OF ROBOT: Factors influencing the choice of a robot, robot performance testing, economics of roboti sation, Impact of robot on industry and society.	8
5	**Material Handling:** Concepts of material handling, principles and considerations in material handling systems design, conventional material handling systems - industrial trucks, monorails, rail guided vehicles, conveyor systems, cranes and hoists, advanced material handling systems, automated guided vehicle systems, automated storage and retrieval systems (ASRS), bar code technology, radio frequency identification technology.	9

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Suggested Specification table with Marks (Theory): (For BE only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
14%	**26%**	**18%**	**42%**	**-**	-

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Richaerd D Klafter, Thomas Achmielewski and Mickael Negin, "Robotic Engineering – An integrated Approach" Prentice HallIndia, New Delhi, 2001.
2. Mikell P. Groover,"Automation, Production Systems, and Computer Integrated Manufacturing",2nd Edition, John Wiley & sons, Inc, 2007
3. James A Rehg, "Introduction to Robotics in CIM Systems", Prentice Hall of India, 2002.
4. Deb S R, "Robotics Technology and Flexible Automation", Tata McGraw Hill, New Delhi, 1994.

Course Outcomes: After learning the course the students should be able to:

Sr. No.	CO statement	Marks % weightage
CO-1	Learn about the basic concepts, parts of robots and types of robots.	25%
CO-2	To design automatic manufacturing cells with robotic control using the principle behind robotic drive system, end effectors, sensor, machine vision robot kinematics and programming.	25%
CO-3	Ability in selecting the required robot.	15%
CO-4	Know various applications of robots.	25%
CO-5	Apply their knowledge in handling the materials	10%

List of Experiments:

Experiments related to following topics may be carried out.

1. Robot pick and place application
2. Robot path planning
3. Sensing ability of robot
4. Study of various material handling systems
5. Counters in material handling applications

6. Vision system control application of robot

List of Equipments:

Robot, Simulation software, Conveying system, sensors, etc

List of Open Source Software/learning website:

NPTEL