

GUJARAT TECHNOLOGICAL UNIVERSITY

SUBJECT: INDUSTRIAL ROBOTICS AND MATERIAL HANDLING SYSTEMS

SUBJECT CODE-2164105

B.E. 6th Semester

Type of course: Professional Core Course

Prerequisite: Robotics inspection, Application of Robot, Automated Material handling system

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						Total Marks
L	T	P		Theory Marks			Practical Marks			
			ESE (E)	PA (M)		PA (V)		PA (I)		
				PA	ALA	ESE	OEP			
3	1	0	4	70	20	10	20	10	20	150

L- Lectures; T- Tutorial/Teacher Guided Student Activity; P- Practical; C- Credit; ESE- End Semester Examination; PA- Progressive Assessment

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
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.	6	14%
2	Robots For Inspection : Robotic vision systems, image representation, object recognition and categorization, depth measurement, image data compression, visual inspection, software considerations.	8	18%
3	Other Applications: Application of Robots in continuous arc welding, Spot welding, Spray painting, assembly operation, cleaning, robot for underwater applications.	8	18%
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.	11	24%

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.	12	26%
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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

1. Learn about the basic concepts, parts of robots and types of robots.
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.
3. Ability in selecting the required robot.
4. Know various applications of robots
5. Apply their knowledge in handling the materials.

List of Tutorial:

1. Introduction to robot application in various fields of industry.
2. Numerical based on visual inspection.
3. Numerical based on performance testing of robot.
4. Numerical based on end effectors analysis.
5. Study about application of robots in manufacturing units.
6. Study about material handling techniques.
7. Storage techniques: Bar code technology.

Active Learning Assignments: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.