

GUJARAT TECHNOLOGICAL UNIVERSITY

ROBOTICS AND AUTOMATION (41)

INDUSTRIAL AUTOMATION

SUBJECT CODE: 2144101

B.E. 4 th SEMESTER

Teaching Scheme			Credits C	Examination Marks						Total Marks
L	T	P		Theory Marks			Practical Marks			
			ESE (E)	PA (M)		PA (V)		PA (I)		
				PA	ALA	ESE	OEP			
4	0	2	6	70	20	10	20	10	20	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	Introduction Concept and scope of automation, Socio economic consideration, Low cost automation	4	8
2	Fluid Power Control Fluid power control elements and standard graphical symbols, Construction and performance of fluid power generators, Hydraulic and pneumatic cylinders - construction, design and mounting; Hydraulic and pneumatic valves for pressure, flow and direction control: Servo valves and simple servo systems with mechanical feedback, governing differential equation and its solution for step position input, Basic hydraulic and pneumatic circuits.	10	20
3	Pneumatic Logic Circuits Design of pneumatic logic circuits for a given time displacement diagram or sequence of operations.	6	12
4	Transfer Devices and Feeders Their Classification: Construction details and application of transfer devices and feeders (Vibratory bowl feeder, reciprocating tube feeder and centrifugal hopper feeder).	8	16
5	Electrical and Electronic Controls Introduction to electrical and electronic controls such as electromagnetic controllers - transducers and sensors, microprocessors, programmable logic controllers (PLC), Integration of mechanical systems with electrical, electronic and computer systems.	8	16
6	Robotics Introduction, classification based on geometry, devices, control and path movement, End effectors - types and applications, Sensors - types and applications, Concept of Robotic/Machine vision, Teach pendent.	7	14
7	Industrial Applications Industrial applications of Robots for material transfer, machine loading / unloading, welding, assembly and spray painting operations.	7	14

Reference Books:

1. Anthony Esposito, Fluid Power with applications, Pearson.
2. S.R. Majumdar, Pneumatic Control, Tata Mc Graw Hill.
3. S.R. Deb, Robotics and Flexible Automation, Tata mc Graw Hill
4. A.K Gupta, S.K. Arora, Industrial Automation and Robotics, Laxmi Pubilaction (P) Ltd.

Course Outcomes:

To make the students understand the fundamentals of automation and various automation The students will be able to

1. Students will demonstrate an ability to apply spatial transformation to obtain forward kinematics equation of robot manipulators
2. Students should understand the working of these systems and should be able to determine hardware and software requirements of PLC.
3. They should further understand how to design any application based on these systems.
4. Also they should understand the requirements of safety and design safety instrumented systems.
5. Students will demonstrate knowledge of robot controllers
6. Students will demonstrate knowledge of the relationship between mechanical structures of industrial robots

List of Experiments:

Practical should be designed to include followings:

1. Design and assembly of hydraulic / pneumatic circuit.
2. Study of power steering mechanism using cut piece model
3. Study of reciprocating movement of double acting cylinder using pneumatic direction control valves
4. Use of direction control valve and pressure control valves clamping devices for jig and fixture.
5. Study of robotic arm and its configuration.
6. Study the robotic end effectors.
7. Study of different types of hydraulic and pneumatic valves