GUJARAT TECHNOLOGICAL UNIVERSITY

MECHANICAL ENGINEERING (19)
AUTOMATION
SUBJECT CODE: 2181922
B.E. 8TH SEMESTER

Type of course: Under Graduate

Prerequisite: NIL

Rationale: The aim of present course is to introduce the students about the basic automation theory and understanding of its devices. Students can think and get innovative idea in the area of shop floor automation.

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)	
					PA	ALA	ESE	OEP		
3	0	2	5	70	20	10	20	10	20	150

Content:

Sr. No.	Content	Total (Hours)	Weightage (%)
1	**Introduction:** Automated Manufacturing System, Reasons for Automating, the USA Principle, Strategies for automation and process improvement, automation migration strategies, levels of automations, Types of Automations.	04	10
2	**Pneumatic System Design:** Introduction, pneumatics system components, pneumatics actuators, application of pneumatics system in automation, pneumatics circuit design for automation, limitations of pneumatics system.	06	12
3	**Hydraulics System Design:** Introduction, Hydraulic system components, hydraulic actuators, application of hydraulic system in automation, hydraulic circuit design for automation, limitations of hydraulic system.	06	12
4	**Programmable Logic Controller and Micro Controller:** Introduction to Programmable logical controller, PLC basics, Basic ladder logic programming, PLC timer function, PLC counter functions. Basics of microcontrollers, Basic components of Microcontrollers, Application of microcontrollers for automations.	06	14

5	**Industrial Robotics and Mechatronics System:** Introduction, Robot Anatomy and Related Attributes, Robot Control Systems, End Effectors, Sensors in Robotics, Industrial Robot Applications, Robot Programming overview. Transducers, Sensors and Actuators: Classification, Principle of Operation, Selection Criteria, Signal Conditioning, Calibration.	08	18
6	**Automated Machinery:** Introductions, Automated transfer machine, automated transfer line, auto-storage and retrieval system, automated guided vehicles, automated material handling system, automated inspection system and CMM.	06	14
7	**Modular Automation Design:** Introduction to modular design, modular automations, Case study for modular design: 1. Casting shop design, 2. Press working shop design, 3. Machine shop design.	06	14
8	**Automation Economy**: Plant Economy, feasibility of automation on economical sense, effect of automation on economy, feasibility of automation in Indian market, Scope of automation in Indian industries, Break Even point analysis for automation.	03	06
	Total	45	100%

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
5	**10**	**20**	**20**	**5**	**10**

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. Automation, Production Systems and Computer Integrated Manufacturing by Mikell P. Groover, P.H.I. Learning Private Limited.
2. Hydraulics and Pneumatics by Andrew Parr, JAICO Publishing Home, Ahmedabad
3. Industrial Automation and Robotics by Er. A. K. Gupta and S. K. Arora, University Science Press, Laxmi Publishing Pvt. Ltd.
4. Programmable Logic Controller by Vijay R. Jadhav, Khanna Publishers, New Delhi
5. Robotics and Control by R. K. Mittal and I. J. Nagrath, McGraw Hill Education (India) Private Limited.

Course Outcome:

1. Students will have knowledge of all automation devices.
2. Students can think and identify scope of automation in shop floor: Casting, Machine shop and Press work
3. Students can understand working of different sensors and actuator and find application for industrial automation
4. Students will have ability to design small automated system.

List of Experiments:

1. To study the fundamentals of automation and its types.
2. Study and report on Pneumatic Automation system.
3. Study and report on Hydraulic Automation system.
4. Study and performance on PLC.
5. Study and report on micro controller and its application.
6. Study and report on Industrial Robotics: Sensors and Actuators
7. Study and report on Different Automated Machinery
8. Study and report on Modular Automation System: Casting shop, Machine shop, Press Shop
9. Study and report on Economic analysis of Automation

Design based Problems (DP)/Open Ended Problem:
Propose the part/product for specified functional requirement by using engineering design aspects and prepared the report on same.

Major Equipment:

1. Pneumatic Automation system
2. Hydraulic Automation System
3. Programmable Logical Controller
4. Industrial Robot

List of Open Source Software/learning website:

http://www.nptel.ac.in
http://www.ocw.mit.edu

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.