



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3171922

Semester – VII

Subject Name: Automation in Manufacturing

Type of course: Professional Elective

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. This subject is useful to understand the different types of automation and production system used in industries

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		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: Automation and types, 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
2	GROUP TECHNOLOGY: Part family, Part classification and coding, production flow analysis – OPITZ classification system, cellular manufacturing, quantitative analysis in cellular manufacturing, Rank Order Clustering Technique (ROC), Holier Method –I,II, Single Linkage Cluster Analysis Technique(SLCA). Application of group technology	06
3	Flexible Manufacturing Systems: Types of flexibility, types of FMS, FMS components, FMS Components-Workstations, Material Handling and Storage Systems, Computer Control System, Human Recourses, FMS Applications and Benefits., Quantitative analysis of FMS, Sizing the FMS, System performance measure. Automated Material Handling & Storage: Functions, Types, Analysis of material handling equipment, Design of Conveyor & AGV systems. Problems. Development for total material handling system.	08
4	Pneumatic and Hydraulic System Design: Introduction, pneumatics and hydraulic system components, pneumatics and hydraulic actuators, application of pneumatics and hydraulic system in automation, pneumatics and hydraulic circuit design for automation, limitations of pneumatics and hydraulic system.	08



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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	04
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
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.	04
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.	05
	Total Hrs	45

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	15	40	25	5	5

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. Robotics and Control by R. K. Mittal and I. J. Nagrath, McGraw Hill Education (India) Private Limited.



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Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Overall understanding of automated systems integration using CIM	20
CO-2	Identify scope of automation in shop floor: Casting, Machine shop and Press work	25
CO-3	Understand working of different sensors and actuator and find application for industrial automation	20
CO-4	Design small automated system	15
CO-5	Application of group technology and FMS	20

List of Experiments:

Experiments based on above contents and should include below mentioned topics.

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 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

List of Open Source Software/learning website:

1. www.nptel.ac.in