



# GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering (Part Time)

Subject Code: 2961911

Automation in Manufacturing

6<sup>th</sup> Semester

**Type of Course: -**

**Pre-requisite:-**

**Rationale:**

The course focuses on the principles, concepts and technologies required/used to automate manufacturing systems containing different equipments and methods. The automotive industry is a known example of a sector applying these systems. Good automation practices, allied with the latest technology, are fundamental in improving production efficiency. The initial part of the course covers the basics of manufacturing and Automation and in next part automated material handling, different control/Inspection and programmable logic controllers (PLC) programming is covered.

Teaching and Examination Scheme:

Teaching Scheme			Credits	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.	Course Content	Total Hours
1	<b>Automation in Manufacturing:</b> Introduction of Manufacturing System, Principles and Strategies of Automation, Basic Elements of an Automated System, Advanced Automation Functions, Levels of Automations. Production Economics: Methods of Evaluating Investment Alternatives, Costs in Manufacturing, Break- Even Analysis, Unit cost of production, Cost of Manufacturing Lead time and Work-in process.	08
2	<b>Type of Automation:</b> Automated Flow lines, Methods of Work-part Transport, Transfer Mechanism, Buffer Storage, Control Functions, and Automation for Machining Operations, Design and Fabrication Considerations. Analysis of Automated Flow Lines: General Terminology and Analysis, Analysis of Transfer Lines Without Storage, Partial Automation, Automated Flow Lines with Storage Buffers, Computer Simulation of Automated Flow Lines.	08
3	<b>Material handling and Identification Technologies:</b> The material handling function, Types of Material Handling Equipment, Analysis for Material Handling Systems, Design of the System, Conveyor Systems, Automated Guided Vehicle Systems. Automated Storage Systems: Storage System Performance, Automated Storage/Retrieval Systems, Work-in-process Storage, Interfacing Handling and Storage with Manufacturing. Product identification system: Barcode, RFID etc. Automated Assembly Systems: Design for Automated Assembly, Types of Automated Assembly Systems, Part Feeding Devices, Analysis of Multi-station Assembly Machines, Analysis of a Single Station Assembly Machine.	08
4	<b>Control Technologies in Automation:</b> Industrial Control Systems, Process Industries Verses Discrete- Manufacturing Industries,	07



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	Continuous Verses Discrete Control, Computer Process Control and its Forms. Computer Based Industrial Control: Introduction & Automatic Process Control, Building Blocks of Automation System: LAN, Analog & Digital I/O Modules , SCADA System & RTU.	
5	<b>Automated Inspection and Testing:</b> Inspection and testing, Introduction to Statistical Quality Control, Automated Inspection, Principles and Methods, Sensor Technologies for Automated Inspection, Coordinate Measuring Machines, Contact and Non Contact Inspection Methods, Introduction to Machine Vision.	07
6	<b>Programmable Logic Controllers (PLCs):</b> Introduction, Micro PLC, Programming a PLC, Logic Functions, Input & Output Modules, PLC Processors, PLC Instructions, Documenting a PLC System, Timer & Counter Instructions, Comparison & Data Handling Instructions, Sequencing Instructions, Mask Data Representation, Typical simple PLC Programming Exercises for Industrial Applications.	07
	Total	45

## Reference Books:

1. Automation, Production Systems and Computer Integrated Manufacturing- M.P. Grover, Pearson Education.
2. Computer Based Industrial Control – Krishna Kant, EEE-PHI
3. Computer automation in manufacturing - an Introduction, Boucher, T. O., Chapman and PHI, 1996.
4. Principles and Applications of PLC – Webb John, Mcmillan 1992
5. An Introduction to Automated Process Planning Systems – Tiess Chiu Chang & Richard A. Wysk
6. Anatomy of Automation – Amber G.H & P.S. Amber, PrenticeHall.
7. CAD/CAM/CIM by P. Radha Krishnan & S. Subrahmanyarn and Raju, New Age International Publishers, 2003
8. System Approach to Computer Integrated Design and Manufacturing/ Singh/John Wiley.
9. Computer Aided Manufacturing, Tien-Chien Chang, Richard A. Wysk and Hsu-Pin Wang, Pearson, 2009.
10. Manufacturing and Automation Technology, R Thomas Wright and Michael Berkeihiser, Good Heart, Willcox Publishers

## Distribution of marks weightage for cognitive level

Bloom's Taxonomy for Cognitive Domain	Marks % weightage
Recall	10
Comprehension	10
Application	30
Analysis	30
Evaluate	20
Create	-



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Course Outcome:

After learning the course the students will be able to:

Sr. No.	CO statement	Marks % weightage
CO-1	Distinguish between different automation strategies and economically evaluate conventional and automated manufacturing systems.	15
CO-2	Analyze automated production flow lines and design automated assembly systems.	15
CO-3	Determine the requirement for Material handling and Identification system.	30
CO-4	Choose the suitable control system for automation for specific application.	20
CO-5	Design and Analyze small programs on PLC.	20

List of Experiments:

As per the syllabus content.

Major Equipment:

As per content

List of Open Source Software/learning website:

1. <http://nptel.ac.in>