



GUJARAT TECHNOLOGICAL UNIVERSITY

Master of Engineering

Subject Code: 3720815

Semester –II

Subject Name: COMPUTER INTEGRATED MANUFACTURING

Type of course: Core IV

Prerequisite: Zeal to learn the subject

Rationale: To address high end technologies used to automate manufacturing operations using computerized integration of product design, planning, production, distribution, and management.

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	Manufacturing Automation: Automated Manufacturing Systems, Computerized Manufacturing Support Systems, Reasons for Automation, Automation Strategies-The USA Principle, Ten Strategies for Automation and Process Improvement, Automation Migration Strategy.	2
2	Automated Flow lines: System Configurations, Workpart Transfer Mechanisms, Storage Buffers, Control of Production Line, Analysis of Transfer Lines-Transfer Lines with No Internal Parts Storage, Transfer Lines with Internal Storage Buffers.	4
3	Manual Assembly Lines: Assembly Workstations, Work Transport Systems, Line Pacing, Coping With Product Variety, Analysis of Single Model Assembly Lines-Repositioning Losses, The Line Balancing Problem, Line Balancing Algorithms-Largest Candidate Rule, Kilbridge and Wester Method, Ranked Positional Weights Method.	6
4	Automated Assembly Systems: System Configurations, Parts Delivery at Workstations, Applications, Quantitative Analysis of Assembly Systems- Parts Delivery System at Workstations, Multi-station Assembly machines, Single Station Assembly Machines, Partial Automation.	4
5	Automatic Material Handling and Storage systems: Design Considerations in Material Handling, Material Transport Equipment-Industrial Trucks, Automated Guided Vehicles, Monorails and Other Rail-Guided Vehicles,	4



GUJARAT TECHNOLOGICAL UNIVERSITY

Master of Engineering

Subject Code: 3720815

	Conveyors, Cranes and Hoists, Analysis of Vehicle Based Systems, Conveyor Analysis. Engineering Analysis of AS/RS and Carousel Systems.	
6	Automated Inspection systems: Overview of Automated Identification Methods, Bar Code Technology, Radio Frequency Identification, Other AIDC Technologies-Magnetic Stripes, Optical Character Recognition, and Machine Vision.	5
7	Computer Aided Process Planning: Retrieval CAPP Systems, Generative CAPP Systems, Graph Based Approach, Attribute Adjacency Graph, Benefits of CAPP.	4
8	Flexible Manufacturing Systems: Types of flexibility, types of FMS, FMS components, FMS Components-Workstations, Material Handling and Storage Systems, Computer Control System, Human Resources, FMS Applications and Benefits., Quantitative analysis of FMS, Sizing the FMS, System performance measure.	5
9	Computer Integrated Manufacturing: The Scope of CAD/CAM and CIM, Computerized elements of a CIM System, Components of CIM, Database for CIM, Planning , Scheduling and Analysis of CIM Systems.	4
10	Rapid Prototyping Introduction, Prototype design methods, prototype design tools, liquid, solid and powder based RP processes, STL format and STL file problems.	4

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	10	30	20	20	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, Mikell P Groover, Prentice Hall, 2007.
2. System Approach to Computer Integrated Manufacturing, Nanua Singh, Wiley & Sons Inc., 1996.
3. Intelligent Manufacturing System, Andrew Kusiak, Prentice Hall Inc., 1992



GUJARAT TECHNOLOGICAL UNIVERSITY

Master of Engineering

Subject Code: 3720815

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Gain an overall understanding of automated systems integration.	20
CO-2	Be able to use and program programmable controllers, robots and CNC machines in an integrated system.	20
CO-3	Be able to develop interfaces necessary to integrate machines with a conveyor system and a host control system for a flexible manufacturing system.	30
CO-4	Demonstrate their understanding by producing a product through an integrated flexible manufacturing system and documenting the results	25
CO-5	Gain an overall understanding of automated systems integration.	15

List of Experiments:

1. Problems on automated flow lines
2. Problems on line balancing, Ranked Positional Weights Method etc. for manual assembly lines
3. Problems on automated assembly systems
4. Problems on quantitative analysis of FMS
5. Sizing problems on FMS
6. STL file format reading and use of related algorithm for its manipulation
7. Problems on scheduling for CIM
8. Demonstration / programming exercise on automated inspection system
9. Demonstration / programming exercise on Automated material handling system

Equipment / Computational facility:

1. AS/RS
2. AGV
3. Workstations.
4. Controlling software and hardware
5. Machine Vision System
6. Loading / Unloading Mechanisms.
7. RP Machine.

List of Open Source Software/learning website: <https://nptel.ac.in/>