

GUJARAT TECHNOLOGICAL UNIVERSITY

MECHANICAL (ADVANCE MANUFACTURING SYSTEM) (50)

COMPUTER INTEGRATED MANUFACTURING SYSTEMS

SUBJECT CODE: 2715006

SEMESTER: I

Type of course: Engineering Science

Prerequisite: None

Rationale: This course is designed to provide a comprehensive technical knowledge about production automation and the role of the computer in modern manufacturing systems.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks						Total Marks
L	T	P		Theory Marks		Practical Marks				
			ESE (E)	PA (M)	PA (V)		PA (I)			
					ESE	OEP	PA	RP		
3	2	2	5	70	30	20	10	20	0	150

Content:

Sr. No.	Contents	Total Hrs.	% Weightage
1	Fundamentals of Manufacturing and Automation: Production operations and Automation in Production Systems, types of automation, Automation Principles & Strategies, Advance mfg. techniques like Digital manufacturing, RPT etc CIM Automation: Computer applications in Design and manufacture- Fundamentals of CAD, CAE, CAM. Introduction to CIM, Evolution, objectives, benefits, limitations, relationship between automation and CIM, reasons for automating, arguments for and against automation.	8	15%
2	High -Volume Production Systems: Automated flow lines, methods of work part transport, transfer mechanisms, buffer storage, analysis of flow lines without storage and with storage buffer, assembly systems, automated assembly system and its types, parts feeding devices, analysis of single stage and multistage assembly machines.	10	20%
3	Development and implementation of an FMS: Planning phase, Integration, System configuration, FMS layouts, Simulation, FMS Project development steps. Project management, Equipment development, Host system development, planning, Hardware & Software development. Automated Material Handling & Storage: Functions, Types, Analysis of material handling equipment, Design of Conveyor & AGV systems. Problems. Development for total material handling system.	12	35%

4	Computer Aided Quality Control (CAQC): Introduction, QC inspection and testing, the computer in QC, Automated inspection principles and methods, sensor technologies for automated inspection – contact and non- contact types, computer aided testing, Integration of CAQC with CAD/CAM.	12	30%
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Reference Books:

1. Groover, M.P: “Automation, Production System and CIM”- Prentice-Hall of India.
2. Vajpayee, “Principles of CIM” - Prentice-Hall of India.
3. Ranky, Paul G: “Computer Integrated Manufacturing”- Prentice-Hall of India.
4. David Bedworth: “Computer Integrated Design and Manufacturing” -TMH, New Delhi.
5. Robert Levine et al;” A Comprehensive guide to AI and Expert Systems”- McGraw Hill Inc, 1986.
6. Mohsen Shahinpoor – Harper & Row publishers, New York. “A Robot Engineering Textbook
7. “Robotics, control vision and intelligence,” Fu, Lee and Gonzalez. McGraw Hill International.
8. Geoffrey Boothroyd, “Assembly Automation and Product Design”, (Manufacturing Engineering and Materials Processing)
9. Radhakrishnan.P, Subramanyan. S, 'CAD/CAM/CIM', New Age International Publishers
10. Horst Tempelmeier and Heinrich Kuhn “Flexible Manufacturing Systems: Decision Support for Design and Operation”

Course Outcome:

After learning the course the students will have knowledge of production systems and how automation is used in these systems, understand basic elements of automation and be able to understand the basic elements of Computer aided quality control.

List of Experiments:

Students are required to perform experiments based on:

- Operation, Control and Programming of various computer controlled machines in the FMS such as CNC machine tools, Automated Storage/Retrieval (AS/RS) systems, Robots, automated assembly station etc Or Any one from the above and Case study presentation on Simulation and performance analysis of the FMS, parts flow control on Assembly station.

Open Ended Problems

1. Select a local manufacturing company. Write in approximately 400 words a report describing how the company carries out its various functions. In another 200 words suggest how the company can exploit CIM.
2. Select any nearby industrial firm employing FMS. Analyse one of their systems like automated material handling or storage system. Alternatively analyse the complete FMS set up based on different theoretical models available. Prepare a brief report for the analysis.
3. Search for a factory which employs automatic production lines/transfer lines. Based on the concepts learnt in the subject analyse the system for production rate, line efficiency, manufacturing lead time for a certain production quantity, buffer capacity to minimize unit product cost or increase efficiency, etc. Analysis may be single- or multi-objective. Comment on the outcome.
4. A company wishes to automate its assembly line operations. You are given the task of carrying out feasibility analysis and giving design guidelines.
 - a. Check conditions to consider automated assembly technology
 - b. Whether single- or multi-station system

c. Propose system configuration, typical hardware components of part delivery system
Estimate the cost involved and comment whether to use automation or not.