GUJARAT TECHNOLOGICAL UNIVERSITY

AUTOMOBILE ENGINEERING (02)
COMPUTER INTEGRATED MANUFACTURING IN AUTOMOBILE INDUSTRY
SUBJECT CODE: - 2180208
B.E. 8TH SEMESTER

Type of Course: - Advanced Application

Pre-requisite:- Manufacturing Processes-I

Rationale: Computer Integrated Manufacturing is highly demanded area now a day. Computer Integrated Manufacturing deals with Design of components to manufacturing and also includes Planning and controlling the processes. Automobile Industries widely use CNC, FMS and Robotics technology now a day. Students will be familiar with its hardware and software and also able to write programs for machining and application of CIM in automobile assembly and ancillaries industries.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total
L	T	P	C	Theory Marks			Practical Marks			Marks
				ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	1	0	4	70	20	10	30	0	20	150

CONTENT:-

S.N.	Course Content	Total Hours	% Weightage
1	**INTRODUCTION TO COMPUTER INTEGRATED MANUFACTURING:** Concepts of Computer Integrated Manufacturing, Objectives & scope, Nature & Type of manufacturing system, Evolution, Benefits of CIM, Role of manufacturing engineers, Application of CIM in Automobile Industry	3	7
2	**NC/CNC MACHINE TOOLS**: NC and CNC Technology: Types, Classification, Specification and components, Construction Details, Controllers, Sensors and Actuators, CNC hardware: Re circulating ball screw, anti-friction slides, step/servo motors. Axis designation, NC/CNC tooling. Fundamentals of Part programming, Types of format, Part Programming for lathe and milling machine operations, subroutines, do loops, canned Cycles.	12	27
3	**PROGRAMMABLE LOGIC CONTROLLERS:** Relay Device components, Programmable controller architecture, programming a programmable controller, tools for PLC logic design, Application of PLC in automobile industry	3	7
4	**GROUP TECHNOLOGY AND CAPP:** Introduction, part families, part classification and coding systems: OPITZ, PFA, FFA, Cell design, rank order clustering, Benefits of group technology. Approaches to Process Planning, Different CAPP system application and benefits.	6	13
5	**ROBOT TECHNOLOGY:** Introduction: Robot Anatomy, Laws of Robot, Human System and	6	13

	Robotics, Coordinate system, Specifications of Robot. Power sources, actuators and Transducers, Robotic Sensors, Grippers, Robot Safety, Robot Applications, Economic Considerations of Robotics system, Concepts of Computer Vision and Machine Intelligence		
6	**FLEXIBLE MANUFACTURING SYSTEM:** Introduction & Component of FMS, Needs of FMS, general FMS consideration, Objectives, Types of flexibility and FMS, FMS lay out and advantages. Automated material handling system: Types and Application, Automated Storage and Retrieval System, Automated Guided Vehicles, Cellular manufacturing, Tool Management, Tool supply system, Tool Monitoring System, Flexible Fixturing, Flexible Assembly Systems.	6	13
7	**ASSEMBLY LINES:** Fundamental of Assembly line and Automated Assembly line, Line balancing algorithm, Concept of transfer line, Design and concept of automated assembly line, Quantitative analysis of assembly line	6	13
8	**INTEGRATED PRODUCTION MANAGEMENT SYSTEM:** Introduction, PPC fundamentals, Problems with PPC, MRP-I, MRP-II. Just in Time philosophy: JIT & GT applied to FMS.	3	7
		45	100

SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Distribution of Theory Marks (%)					
R Level	U Level	A Level	N Level	E Level	C Level
10	10	15	11	10	**14**

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, Pearson Education
2. Robotics Technology and Flexible Automation, by S R Deb, S Deb, McGraw Hill Education Private Limited.
3. Flexible Manufacturing Cells and System -William. W. Luggen Hall, England Cliffs, Newjersy
4. Computer Numerical Control, P. Radhakrishnan, New Central Book Agency, 1992.
5. Computer integrated manufacturing -S. Kant Vajpayee – Prentice Hall of India.
6. System Approach to Computer Integrated Manufacturing. Nanua Singh, Wiley and sons Inc, 1996

COURSE OUTCOME:

After learning the course the students should be able to:
1. Students will describe basic concepts of CIM application and benefits.
2. Students will prepare CNC programs for manufacturing of different geometries on milling and lathe machines.
3. Students will prepare logic diagram for different application of automation.
4. Students will classify different components using different techniques of group technology
5. Students will prepare Process planning for different components in automobile Industry
6. Students will select layouts of FMS for industrial applications
7. Students will describe Robot for preliminary industrial applications like pick and place.

8. Student will identify application of PPC, JIT, MRP-I, MRP-II, and Expert system to CAM
9. Student will design and implement concept of automated assembly line in automobile industry

Tutorial:
1. Study of computer integrated manufacturing systems: Basics, Types of manufacturing role of management and CIM wheel
2. NC/CNC technology: Definition, Classification, Specification, Construction details, Sensors and Actuators, and different controllers
3. CNC part Programming: Lathe jobs
4. CNC part Programming: Milling jobs
5. Study of PLC in Automobile manufacturing Industry
6. Study of Flexible manufacturing system in Automobile Industry
7. Study of robotics technology
8. Study of automated assembly line.

Major Equipment:
1. CNC Machine
2. Industrial Robot
3. Programming Software.

List of Open Source Software/learning website:
1. www.nptel.ac.in/ Prentice
2. Videos on CNC programming, PLC, Robotics and FMS

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.