



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3161917

Semester –VI

Subject Name: Computer Aided Manufacturing

Type of Course: Elective

Prerequisite: Manufacturing Processes, Manufacturing Technology

Rationale:

Computer Aided Manufacturing is highly demanded area now a day. Computer Aided Manufacturing deals with Design of components to manufacturing and also includes Planning and controlling the processes. 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.

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 Hours
1	Computer Aided Manufacturing: CAM Concepts, Objectives & scope, Nature & Type of manufacturing system, Evolution, Benefits of CAM, Role of management in CAM, Concepts of Computer Integrated Manufacturing, Impact of CIM on personnel, Role of manufacturing engineers, CIM Wheel to understand basic functions.	04
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 drilling, lathe and milling machine operations, subroutines, do loops, canned Cycles, parametric subroutines.	09
3	Programmable Logic Controllers: Relay Device components, Programmable controller architecture, programming a programmable controller, tools for PLC logic design.	02
4	Group Technology and CAPP: Introduction, part families, part classification and coding systems: OPITZ, PFA, FFA, Cell design, rank order clustering, composite part concepts, Benefits of group technology. Approaches to Process Planning, Different CAPP system, application and benefits.	06
5	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,	07



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	Flexible Fixturing, Flexible Assembly Systems.	
6	Robot Technology: Introduction: Robot Anatomy, Laws of Robot, Human System and Robotics, Coordinate system, Specifications of Robot. Power sources, actuators and Transducers, Robotic Sensors, Grippers, Robot Safety, Robot Programming and Robot Applications, Economic Considerations of Robotics system, Robot Kinematics and Dynamics, Robot Arm Dynamics. Concepts of Computer Vision and Machine Intelligence.	07
7	Integrated Production Management System: Introduction, PPC fundamentals, Problems with PPC, Introduction to ERP. Just in Time philosophy: JIT & GT applied to FMS, concepts of Expert System in Manufacturing and Management Information System.	07

Suggested Specification table with %Marks (Theory):

Distribution of Theory Marks %					
R Level	U Level	A Level	N Level	E Level	C Level
10	20	25	25	10	10

R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Course Outcomes: Students will be able to:

Sr. No.	CO statement	Marks % weightage
CO-1	Illustrate Computer Aided Manufacturing with NC, CNC and PLC technology for Industry	30
CO-2	Describe the Group Technology and Computer Aided Process Planning.	15
CO-3	Describe Flexible Manufacturing System with tools and equipment's.	20
CO-4	Describe Robot technology for Computer Aided Manufacturing system.	15
CO-5	Demonstrate Integrated Production Management system.	20

Reference Books:

1. Computer Aided Manufacturing by Tien Chien Chang, Pearson Education.
2. Automation, Production Systems and Computer Integrated Manufacturing by Mikell P Groover, Pearson Education.
3. Robotics Technology and Flexible Automation, by S R Deb, S Deb, McGraw Hill Education Private Limited.
4. Flexible Manufacturing Cells and System -William. W. Luggen Hall, England Cliffs, Newjersy.
5. P.Radhakrishnan, "Computer Numerical Control ", New Central Book Agency, 1992.
6. Computer integrated manufacturing -S. Kant Vajpayee – Prentice Hall of India.
7. System Approach to Computer Integrated Manufacturing. Nanua Singh, Wiley and sons Inc, 1996.
8. Computer Aided Manufacturing- Rao, Tewari, Kundra, McGraw Hill, 1993.



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9. CAD/CAM, Principles and Applications –P N Rao, McGraw Hill, 2010.
10. CAD/CAM, Introduction, -Ibrahim Zeid, Tata McGraw Hill, 2007.

List of Experiments:

1. Study of Computer Integrated System: 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 and Milling jobs
4. Exercise on PLC for Simple problems.
5. Problems on GT and Industrial case problems on coding
6. Problems on CAPP and Industrial case problems
7. Study of Flexible Manufacturing system
8. Study of Robotics Technology
9. Study of Expert System in Manufacturing and MIS

Major Equipment:

1. CNC Machine
2. Industrial Robot
3. Programming Software.
4. CAD on Cloud Free software like Fusion 360

List of Open Source Software/learning website:

1. www.nptel.ac.in
2. Videos on CNC programming, PLC, Robotics and FMS