



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3172509

Semester – VII

Subject Name: Computer Aided Design and Manufacturing

Type of course: Professional Elective

Prerequisite: Nil

Rationale:

Computer Aided Design is successful in manufacturing as they replace the specifications of numerical parameters, a task difficult for humans to perform reliably. Moreover, editing of visual realism is much more natural for humans to perform. It implies that any engineer can use both systems combined or individually for designing a product or controlling manufacturing processes

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	Introduction: Introduction, Reasons for implementing a CAD system, Benefits, Features of CAD software, 2D and 3D Geometric transformations, homogeneous coordinates.	08
2	Curves and Surfaces: Parametric representation of synthetic curves Hermit cubic splines Bezier curves, B-splines. Mathematical representation surfaces, Surface model, Surface entities surface representation, Parametric representation of surfaces, plane surface, rule surface, surface of revolution, Tabulated Cylinder.	07
3	Solid Modelling, Data Structures and Data Exchange: Solid Representation, Boundary Representation (B-rep), Constructive Solid Geometry (CSG). Data structures for CAD Models, Graphics standards – Data exchange format, evolution- features of various interfaces GKS, IGES, DXF, PDES, STEP. Networking- networking techniques, LAN, components, wiring methods, network interface cards, network standards	08
4	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, types of indexing, automatic tool changers (ATC), automatic pallet changers (APC), timing gear belt, types of control, concept of DNC NC/CNC tooling. Fundamentals of Part programming, Types of format, Part Programming	12



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	for drilling, lathe and milling machine operations, subroutines, do loops, canned Cycles, parametric sub routines.	
5	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	06
6	Computer Aided Process Planning: Retrieval CAPP Systems, Generative CAPP Systems, Graph Based Approach, Attribute Adjacency Graph, Benefits of CAPP.	04
	Total Hours	45

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	15	40	25	5	5

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. Parametric and feature based CAD/CAM, Shah J.J., Mäntylä M., 1995, John Wiley Sons Inc.
2. Mechatronics, HMT, McGraw Hill Education
3. James V. Valentino and Joseph Goldenberg, Introduction to Computer Numerical Control, 5th ed, Prentice Hall, Englewood Cliff, New Jersey, 2012.
4. Yoram Koren, Computer control of Manufacturing Systems, McGraw Hill, 2006
5. T.K. Kundra, P.N.Rao, N.K. Tewari, Numerical Control and Computer Aided Manufacturing, Tata McGraw Hill Publishing Company Ltd.
6. David Gibbs and Thomas Crandall, CNC Machining and Programming: An Introduction, Industrial Press Inc., 2003.
7. Robotics, control vision and intelligence, Fu, Lee and Gonzalez. McGraw Hill International.

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
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CO-1	Overall understanding of CAD systems design of component	20
CO-2	Use feature based modelling for design for manufacturing	25
CO-3	Understand Computer Aided Manufacturing technology, through programming, setup, and operations of various Computer Numerical Control (CNC) machine tools	35
CO-4	Describe Robot for preliminary industrial applications	10
CO-5	Application of CAPP in manufacturing	10

List of Experiments:

Experiments based on above contents and should include below mentioned topics.

1. Drafting and Solid Modelling exegesis
2. Discuss types of curves and surfaces
3. Study different types of Solid modeling and differentiate between them
4. NC/CNC technology: Definition, Classification, Specification, Construction details, Sensors and Actuators, and different controllers
5. Manual part programming for CNC lathe without canned cycles
6. CNC part Programming: Lathe and Milling jobs
7. To study different types of robot
8. Demonstrate computer aided process planning

List of Open Source Software/learning website:

1. www.nptel.ac.in