

GUJARAT TECHNOLOGICAL UNIVERSITY

MECHATRONICS ENGINEERING (20) COMPUTER AIDED DESIGN FOR MECHATRONICS SUBJECT CODE: 2162006 B.E. 6th Semester

Type of course: Engineering Science (Departmental Elective - I)

Prerequisite: NA

Rationale: CAD for mechatronics give students greater depth of technical knowledge in the areas of design using modeling and analysis software's. To learn detailed engineering of 3D models and application of computer system to a solution of design problem.

Teaching and Examination Scheme:

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

Sr. No.	Course Content	Total Hours	Weightage (%)
1	FUNDAMENTAL OF CAD: Introduction to CAD and Design process, Product cycle and CAD, Importance of Computer graphics and CAD, Reasons for implementing cad, conventional design vs CAD, Computer system hardware and software, Applications and benefits of CAD	04	10.5%
2.	CAD SYSTEM : CAD system configuration, Hardware : Display devices, Hard-copy devices, Interactive input devices, Display processors Software : Features, Graphic standards: GKS, PHIGS, IGES, STEP and PDES Graphics and computing standards, data exchange standards, Design Database, Interfacing design and drafting	05	13.1%
3.	FUNDAMENTALS OF COMPUTER GRAPHICS: Homogeneous coordinate system, Output primitives and their attributes, 2D and 3D transformations: scaling, translation, rotation, mirroring, clipping, shearing, scan conversion, Rasterisation :DDA & Bresenham's algorithm, discussion extended to circle generation	06	15.78%
4.	GEOMETRICAL MODELING: Types & mathematical representation of curves, wire frame models, entities, representations, parametric representations Curves: synthetic and analytic curves, parametric representation of line and circle, Cubic splines and Bezier curves, concept of blending shape function	16	42.10%

	Surfaces & solids – model, entities, representations, fundamentals of surface and solid modeling, B-rep, constructive solid geometry (CSG), analytical modeling, Boolean operation, Feature based Parametric and Variational modeling Computer aided design of Mechanical Elements & Mechanical Assembly with animation. Capabilities of various commercially available software in the area of CAD		
5.	Optimization: Introduction, design synthesis, Engineering vs Optimum Design, Objectives of Optimization, Classification of Optimization problems and their procedure, techniques of optimization, Optimized design of machine components.	7	18.42%

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
35	30	15	10	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. Computer Graphics - Hearn & Baker, PHI
2. CAD/CAM: Computer Aided design and Manufacturing by Mikell Groover and Zimmer, Pearson Education
3. Mathematical Elements for Computer Graphics - David F. Rogers & J. Alan Adams, McGraw Hill
4. Optimization Methods by S.S. Rao, New Age International Publications
5. CAD/CAM Theory & Practice by Ibrahim Zeid, Tata Mc Graw Hill
6. Computer Graphics & design by P. Radhakrishnan, C.P. Kothanadaraman, New Age publication
7. Computer Aided Engineering & Design by Jim Browne, New Age International Publications.
8. CAD/CAM: Computer Aided Design and Computer Aided Manufacturing by P K Jain, S Chand & Co

Course Outcomes:

After successful completion of the course the students shall be able to:

1. Model the 3-D geometric information of machine components including assemblies, and automatically generate 2-D production drawings.
2. Understand the basic analytical fundamentals that are used to create and manipulate geometric models in a computer program
3. Learn to create shapes including Bezier curves and surfaces used in different mechanisms.
4. Learn to optimize the design of machine components.

List of Practical:

Expt No.	Objective of Experiment
01	Introduction to Creo parametric 2.0
02	Sketching features
03	Geometric features
04	Datum commands
05	Creating solids
06	Modifying features
07	Drafting features
08	Generating assembly hierarchy
09	Constructing assembly
10	Generating sequence and animation

Design based Problems (DP)/Open Ended Problem:

Student may be given a task to design any assembly of mechanical component in 3D software.

Major Equipments / Software:

1. Creo parametric 2.0 software

List of Open Source Software/learning website:

The website of NPTL may be utilized for additional learning.

Active learning Assignments (AL) : Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ part of chapters to groups of students so that the entire syllabus of CAD for mechatronics covered. The power-point slides should be put up on the web-site of the college/Institute, along with the name of the group, the name of faculty, Department and College on the first slide. The best three works should be sent on achievements@gtu.edu.in.