GUJARAT TECHNOLOGICAL UNIVERSITY
MECHATRONICS ENGINEERING
B. E. SEMESTER: VII

Subject Name: **Computer Aided Design for Mechatronics**
Subject Code: **172006**

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	University Exam (E)		Mid Sem Exam (Theory) (M)	Practical (Internal)
				Theory	Practical		
4	0	2	6	70	30	30	20

Sr. No	Course Content	Total Hrs.
1.	**Fundamental of CAD:** Introduction, 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	4
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,PDES)	4
3.	**Fundamentals of Computer Graphics:** Homogeneous coordinate system, Output primitives and their attributes, 2D and 3D transformations: scaling, translation, rotation, mirroring, clipping, scan conversion, Rasterisation :DDA & Bresenham's algorithm, discussion extended to circle generation	8
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 Surfaces & solids – model, entities, representations, fundamentals of surface and solid modeling, B-rep, constructive solid geometry (CSG), analytical modeling, Orthographic projection, Boolean operation.	12

5.	**Finite Element Analysis:** Introduction, Types of elements, types of error, introduction to matrix notation, General step of the FEM, derivation equitation finite element procedure, Stress – deflection – stiffness matrix, global matrix, connectivity table, advantage of FEM, Matrix algebra and Gaussian elimination **One dimensional problems:** Elimination approach, penalty approach, effect of temperature, principle of min. Potential energy, Rayleigh-Ritz method, shape function, linear and quadratic shape function **Truss:** Introduction , local and global coordinate system, two bar trusses **Two Dimensional** FEM modeling, constant strain triangle(CST), Isoparameric representation Mesh generation, Capability of different FEA software.	20

List of Experiments:

Expt. No.	Objective Of Experiment	Module used (turns)
01	Selecting work plane, review of Auto Desk inventor software and different windows (drawing, list, prompt, icon)	Master modeler (05)
02	Sketching features	
03	Geometric features	
04	Creating solids	
05	Modifying features	
06	Generating assembly hierarchy	Master assembly (02)
07	Constructing assembly	
08	Generating sequence and animation	Mechanism (01)
09	2D drafting	Drafting (01)
10	FEM of 1D, 2D, 3D problems	Simulation(01)
11	Sheet metal Problem	Sheet metal(01)

Text Books:

1. Computer Graphics - Hearn & Baker, PHI
2. Finite Element Analysis by Chendraupatla, EEE Publication.

Reference Books:

1. Computer Graphics & design by P. Radhakrishnan, C.P. Kothanadaraman, New Age publication
2. Computer Aided Engineering & Design by Jim Browne, New Age International Publications
3. CAD/CAM: Computer Aided design and Manufacturing by Mikell Groover and Zimmer, Pearson Education
4. Mathematical Elements for Computer Graphics - David F. Rogers & J. Alan Adams McGraw Hill.
5. CAD / CAM Theory & Practice by Ibrahim Zeid, Tata Mc Graw Hill