

**5MD02: COMPUTER AIDED DESIGN
CREDITS - 4 (LTP:3,0,1)**

Teaching and Assessment Scheme:

Teaching Scheme (Hours per week)			Credits	Assessment Scheme				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE	CE	ESE	CE		
3	0	2	4	60	40	20	30	150

Course Content:

Unit No.	Topics	Teaching Hours
1	Introduction: Conventional and computer aided design processes, Product Life Cycle and Role of CAD, Applications of CAD.	02
2	2D and 3D Transformations: Homogeneous Coordinates, 2D (Translation, Rotation, Scaling and Shear) and 3D transformations (Translation, Rotation, Scaling, Shear, Orthographic, oblique and Perspective Projections), Windows to View port transformation, Clipping	07
3	Curves: Parametric representation of analytic curves, Parametric and Geometric continuity conditions Conics, Spline representation Hermite Curves (Algebraic and Geometric Forms, Basis Functions, Matrix Form, Continuity conditions, Tangent Vectors, Truncating and Sub-dividing) Bézier Curves (Bézier basis functions, control points, truncating and subdividing, composite Bézier curve, characteristics of Bézier curve) B-Spline Curves (Uniform, open-uniform and non-uniform B-Spline basis functions, Quadratic and Cubic B-Spline basis function, Rational B-spline curves)	06
4	Surfaces: Implicit and explicit function of surfaces, types of surfaces, Surface Representation, Surface Analysis (Tangent, Normal, Twist, Distance Calculation, Curvature, Tangent Plane), Plane Surface, Ruled Surface, Surfaces of Revolution, Tabulated Surfaces, Hermite Bi-cubic surface, Bézier Surface, Coons Surface.	05
5	Solids: Introduction, Solid Representation, Properties of Solid model, Regularized Boolean set operations, Primitive instancing, Sweep representations, Boundary representations (B-rep), Constructive Solid Geometry (CSG)	05

Unit No.	Topics	Teaching Hours
6	<p>Feature based Modelling: Features and primitives, Feature entities, 3D sketching, Feature representation, Creating features, Parametrics, Relations and constraints, Feature manipulations</p> <p>Geometric and Mass Properties: Geometric Properties, Calculate length of contours and curves, Calculate areas, Calculate centroids, Calculate inertia properties, Mass Properties, Properties Evaluation.</p> <p>Assembly Modelling: Differences between part and assembly modelling, Mating conditions, Bottom-up assembly modelling approach, Top-down assembly modelling approach, WCS and mate methods to assemble parts, Managing assemblies, Working with subassemblies, Assembly analysis</p>	10
7	<p>CAD Database: Evaluation of data — exchange format, IGES data representations and structure, STEP Architecture, implementation, ACIS & DXF Introduction to product data standards and data structures.</p>	03
8	<p>Applications of Surface and Solid Model: Solid Modeling for Part, Assembly: Bottom-up and Top-down assembly approaches, Interference Detection, Finite Element Analysis, Computer Aided Part Programming, Computer Aided Process Planning, Automated Layout and Drafting, Computer Aided Manufacturing. Product Lifecycle Management.</p>	04
Total		42

List of References:

1. Ibrahim Zeid, “*Mastering CAD / CAM*”, McGraw-Hill.
2. Ibrahim Zeid, “*CAD / CAM: Theory and Practice*”, McGraw-Hill.
3. David F Roger and J A Adams, “*Mathematical Elements of Computer Graphics*”, McGraw Hill.
4. M Mortenson, “*Geometric Modelling*”, Industrial Press.
5. David Salomon, “*Computer Graphics and Geometric Modelling*”, Springer.
6. Hearn and Baker, “*Computer Graphics: C Version*”, Prentice Hall of India.
7. Anupam Saxena and Birendra Sahay, “*Computer Aided Engineering*”, Design Springer.
8. Gerald Farin, “*Curves and Surfaces for CAGD: A Practical Guide*”, 5/e, Morgan Kaufmann.
9. Dugam Um, “*Solid Modeling and Applications: Rapid Prototyping, CAD and CAE Theory*”, Springer Publications.