GEOMETRIC MODELLING

Course Code	**22MEMD1T4**	**Year**	I	**Semester**	I
Course Category	Programme Core	**Branch**	ME	**Course Type**	Theory
Credits	4	**L-T-P**	4-0-0	**Prerequisites**	Nil
Continuous Internal Evaluation:	40	**Semester End Evaluation:**	60	**Total Marks:**	100

Course outcomes: At the end of the course, the student will be able to:

CO	Statement	BTL	Units
CO1	Express types of manipulation techniques, mathematical representation schemes for various entities used in geometric modeling.	L3	1
CO2	Formulate algebraic and geometric form of a cubic spline, Bezier, and B-Spline curves and their derivatives.	L3	2
CO3	Develop parametric representation of analytic and synthetic surfaces.	L3	3
CO4	Distinguish various schemes used for construction of solid models.	L3	4

Contribution of Course outcomes towards achievement of programme outcomes & Strength of correlations (High:3, Medium: 2, Low:1)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	2	3		3	2		1	1			2	3	2
CO 2	2	2	3		3	2		1	1			2	3	2
CO 3	2	2	3		3	2		1	1			2	3	2
CO 4	2	2	3		3	2		1	1			2	3	2

Syllabus		
Unit	**Contents**	**Mapped CO**
I	**TRANSFORMATIONS IN GEOMETRIC MODELING**: Introduction, Translation, Scaling, Reflection, Rotation in 2D and 3D. Homogeneous representation of transformation, Concatenation of transformations. **CUBIC SPLINES:** Definition, Explicit and implicit equations, parametric equations. Algebraic and geometric form of cubic spline, tangent vectors, parametric space of a curve, blending functions, four-point form, reparametrization, truncating and subdividing of curves.	**CO1**

II	**BEZIER CURVES**: Bezier curve definition, matrix representation of Bezier curves, Bernstein basis, equations of Bezier curves, properties, derivatives, increasing the flexibility of Bezier curves, degree elevation. **B-SPLINE CURVES**: B-Spline curve definition, properties, convex hull properties of Bspline, knot vectors, B-spline basis function, B-spline curve control, open, periodic, non-uniform B-spline curves, matrix formulation of B-spline curve, end conditions of periodic Bspline curve, equations, and derivatives.	**CO2**
III	**INTRODUCTION**: Surface Models, Surface Representation. Parametric Representation of Analytic Surfaces - Plane Surface, Ruled Surface, Surface of Revolution, Tabulated Cylinder. Parametric Representation of Synthetic Surfaces - Hermit Bi-cubic Surface, Bezier Surface, B-Spline Surface, Coons Surface, Gaussian curvature.	**CO3**
IV	**SOLIDS IN GEOMETRIC MODELING FOR DESIGN:** Solid entities, Boolean operations, Topological aspects, Invariants. B-rep of Solid Modelling, CSG approach of solid modelling. Popular modeling methods in CAD.	**CO4**

Learning Resources
Text Book(s): 1. Geometric Modeling (1st edition) by Micheal. E. Mortenson, McGraw Hill Publishers, First edition 2. Elements of Computer Graphics (1st edition) by Roger & Adams Tata McGraw Hill. First edition
References: 1. An Introduction to Nurbs with Historical perspective (1st edition) by David F Rogers. First edition