Computational Geometry

Semester IV	Subject Code: BS41603	Lectures: 60

Objectives:

The syllabus aims in equipping students with,

- Understanding mathematical base of computer graphics and animation
- Solid foundation in the field and to study some applications of Computational Geometry

Unit 1: Two dimensional transformations	16

- Representation of points
- Transformations and matrices
- Transformation of points
- Transformation of straight lines
- Midpoint transformation
- Transformation of parallel lines
- Transformation of intersecting lines
- Transformation , rotations, reflections, scaling, shearing
- Combined transformations
- Transformation of a unit square
- Solid body transformations
- Transformation and homogeneous coordinates, Translation
- Rotation about an arbitrary point
- Reflection through an arbitrary line
  - Projection – a geometric interpretation of homogeneous coordinates
  - Overall Scaling
- Point at infinity

Unit 2: Three dimensional transformations	16
• Introduction • Three dimensional –Scaling, shearing, rotation, reflection, translation • Multiple transformations • Rotation about – an axis parallel to coordinates axes, an arbitrary axis in space • Reflection through – coordinates planes, planes parallel to coordinate planes, arbitrary planes • Affine and perspective transformations • Orthographic projections • Axonometric projections • Oblique projections • Single point perspective transformations • Vanishing points	

Unit 3: Plane Curves	10
• Introduction • Curve representation • Non – parametric curves • Parametric curves • Parametric representation of a circle and generation of circle • Parametric representation of an ellipse and generation of ellipse • Parametric representation of a parabola and generation of parabolic Segment • Parametric representation of a hyperbola and generation of hyperbolic segment.	

Unit 4: Space curve	**6**
• Bezier Curves – Introduction, definition, properties (without proof) • Curve fitting (upto n = 3) equation of the curve in matrix form (upto n = 3) • B Spline Curve-Introduction, definition and properties(without proof)	

***Contact hours – 12 hours**

Reference Books:

1. D. F. Rogers, J. A. Adams, ***Mathematical elements for Computer graphics***,Sec ond edition, Mc Graw Hill Intel Edition.
2. Schaum Series, ***Computer Graphics***.
3. Donald Hearn, M. Pauline Baker, ***Computer Graphics C Version***, Second edition, Pearson