



Mathematics Paper-I
Computational Geometry
[CORE COURSE]

Semester: IV	Credits: 2	Subject Code: BS42103	Lectures: 36
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Course Outcomes:

After completion of the course, the learner will be able to

- Illustrate the basic structures of 2D and 3D graphics systems, construct and apply composite transformations.
- Explain the core concepts of computer graphics, including projection, perspective, and transformation in two and three dimensions.
- Identify the parallel and perspective projections.
- Develop the points on various curves.

Unit 1: Two-Dimensional Transformations	12
<ul style="list-style-type: none">• Introduction.• 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.• Translations and homogeneous coordinates.• Rotation about an arbitrary point.• Reflection through an arbitrary line.	

Unit 2: Three-Dimensional Transformations	8
<ul style="list-style-type: none">• Introduction.• Three dimensional – Scaling, shearing, rotation, reflection, translation.• Multiple transformations.• Rotation about – an axis parallel to coordinate axes, an arbitrary line• Reflection through – coordinate planes, planes parallel to coordinate planes , an arbitrary plane	

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Unit 3: Projection	8
<ul style="list-style-type: none"> • Orthographic projections. • Axonometric projections. • Oblique projections • Single point perspective projection 	

Unit 4: Plane and space Curves:	8
<ul style="list-style-type: none"> • Introduction. • Curve representation. • Parametric curves. • Parametric representation of a circle and generation of points on circle. • Parametric representation of a circle and generation of points on ellipse. • Parametric representation of a circle and generation of points on parabola. • Bezier Curves – Introduction, definition, properties (without proof), • Curve fitting (up to $n = 3$), equation of the curve in matrix form (upto $n = 3$) 	

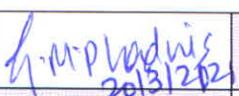
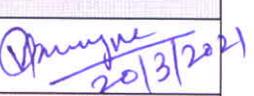
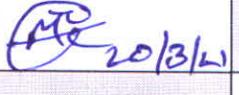
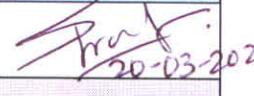
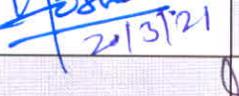
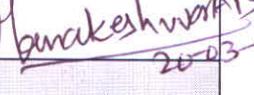
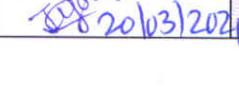
No of Teaching Hours 36 + Contact Hours: 12

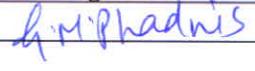
Recommended Text Books:
<ul style="list-style-type: none"> • D. F. Rogers, J. A. Adams, <i>Mathematical elements for Computer graphics</i>, Mc Graw Hill Intnl Edition. <ul style="list-style-type: none"> ○ Unit 1: Chapter 2: Sec. 2-1 to 2.17 ○ Unit 2: Chapter 3: Sec. 3.1 to 3.10, ○ Unit 3: Chapter 3: Sec. 3.12 to 3.14 ○ Unit 4: Chapter 4: Sec. 4.1, 4.2, 4.5, Chapter 5: Sec. 5.1, 5.8 • Schaum Series, Computer Graphics..

Reference Books:
<ul style="list-style-type: none"> • Donald Hearn, M. Pauline Baker, Warren Carithers, <i>Computer Graphics with OpenGL</i>, Pearson (4th Edition)

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Subject Expert (Outside SPPU)	Dr. Prashant Malavadkar	 20/3/2021
VC Nominee	Dr. Vinayak Joshi	 20/3/2021
Industry Expert	Mr. Anup Manakeshwar	 20/3/2021
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