



Title : 3D Geometric modeling and reconstruction

Pre-requisite: Nil

Objectives: The major objectives of the course are:

1. To present an overview of 3D modeling and reconstruction and to improve the knowledge on surface modeling in graphics
2. To explore the behavior and characteristics of the most popular modeling representations and their uses in design and engineering applications
3. To learn standard ways of constructing various shapes and principles behind the generation of complicated shape
4. To learn the development of computer-based modeling algorithms

Outcomes: Recent advances in real-time 3D technologies are allowing fully interactive virtual environments to be created and displayed on common desktop and home gaming computers, instead of the expensive research machines of years past. As it becomes feasible for artists and designers to create these rich virtual environments, they need to be aware of both practical and aesthetic issues unique to interactive 3D worlds. It is this course's aim to present the modelling and reconstruction techniques, experiences, and implications of virtual environments development.

Course Code: CSE-865

Credit Hours: 3-0

Course Contents with proposed contact Hours (Weekly plan):

Week	Topic
1	Introduction to 3D Geometric Modeling
2-3	Digital Shape Representations – Solids, Surfaces and Meshes
4	Data Structures and Meshes
5-7	Reconstruction <ul style="list-style-type: none">• Primitive based (ICT,BPA)• volumetric (Marching Cubes)• smooth surface (Voronoi diagrams,• Delauney triangulation,• alpha shapes
8-10	Parametric Curves – Bezier, Splines and Rational Bezier
11-13	Parametric Surfaces – Bezier and Rational Bezier
14	B-Splines – Curves and Surfaces, NURBS
15	Surface Modeling and Free-form deformation
16	Subdivision Surfaces – Catmull Clark, Loop Butterfly, Doo Sabin

Details of lab work/workshop practice, if applicable:

Nil

Recommended reading, including textbooks, reference books with dates

1. Mario Botsch, Leif Kobbelt, Mark Pauly, Pierre Alliez, Bruno Levy, *Polygon Mesh Processing*, CRC Press 2010.
2. K. Joy, *Geometric Modeling*, Online notes.
<http://idav.ucdavis.edu/education/CAGDNotes/homepage.html>.
3. C. K. Shene, *Computing with Geometry*, Online notes.
www.cs.mtu.edu/~shene/COURSES/cs3621/NOTES/notes.html.
4. John Vince, *Mathematics for Computer Graphics*, 6th Edition, Springer 2022, ISBN978-1-4471-7519-3

Nature of Assessments