Birla Institute of Technology & Science, Pilani
Hyderabad Campus

FIRST SEMESTER 2023-2024

Course Handout Part II

Date: 11/08/2023

In addition to part I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No. : **IS F311**
Course Title : **Computer Graphics**
Instructor-in-charge : **Prof. Tathagata Ray**

Scope and Objective of the Course

The course mainly covers Graphics I/O hardware, Generation of dot, lines, conics, curves, surfaces & polygons; Filling closed regions, 2D & 3D Graphics & Transformations, Windowing, Viewing & Clipping, Efficient algorithms, Solid Modeling, Color Models & Dithering, Visible surface detection, Rendering, Animation Techniques, Advanced modeling and Future directions.

The objective of the course is to

- Able to compute all the transformations used in a graphics pipeline.
- Able to compute all the required algorithms used in every phase of the graphics pipeline.
- Able to implement it in OpenGL.
- Able to implement and compute basic geometric modeling constructs.
- Able to calculate lighting models.

Text Book

T1: James D. Foley, A. Van Dam, S.K. Feiner, and J.F. Hughes, Computer Graphics: Principles and Practice in C, 2nd edition Pearson education.

Reference Books

R1: Sumanta Guha, "Computer Graphics through OpenGL, From Theory to experiments", 3rd Ed., CRC Press, 2019
R2: Rogers B., "Mathematical elements of Computer Graphics", Tata McGraw Hill, 2002.
R3: D. Hearn and M.P. Baker, Computer Graphics: C Version, Pearson Education, 2002.
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Course Plan

L.No.	Learning	Topics to be covered	Reference

	Objectives		to Text
01-03	Definition Why to study Applications I/O Devices	Overview of graphics systems – What, Why & Where about Graphics, Hardware & Software, Input & Output Technology, Mathematical complexity involved - Demonstration through some examples	T1: Ch 1 Ch 4.4 R1: Ch 1, Ch2
04-07	Fast algorithms to draw Lines, Conic, And filled regions	Raster Graphics Algorithms for Drawing 2D objects: Lines, Circle, Ellipse, Parabola, Hyperbola, Polygon & Filled Closed Objects	T1: Ch 3.1-3.9 R1: Ch 14
08-10	Concepts of 3D and OpenGL	Introduction to 3D- Graphics & 3D Coordinate Geometry and Introduction of OpenGL	R1: Ch 2, 3
11-13	How & why to manipulate objects	2D & 3D Scaling, Translation, Rotation, Shear, Reflection, Projection and Composite Transformations	T1: Ch 5.1–5.3 T1: Ch 5.5-5.8 R1: Ch 4, Ch 5
14-16	Mapping 2D from World to Screen	Viewing & Clipping in 2D (Cohen's and Parametric Line Methods)	T1: Ch 5.4 Ch 3.11-3.12 R1: Ch 14
17-20	Mapping 3D from World to Screen, and Foreshortening	Viewing & Clipping in 3D (Perspective & Parallel projection, Clipping against a Canonical View Volume, Clipping in Homogeneous Coordinates, and Mapping into a View-port	T1: Ch 6 R1: Ch 4
21-25	Drawing Smooth Curves & Surfaces	Hermite, Bezier, Continuities, Bspline Curves & Surfaces Rational Cubic Polynomial Curves & Quadric Surfaces)	T1: Ch 11 R1: Ch 17, Ch 18.2
26-28	Representation of Solid Objects	Solid Modeling (Representations, Operations, Geometry, and Interface)	T1: Ch 12 R1: Ch 10
29-33	Detection of Hidden portions	Visible Surface Detection (Need & Algorithms, Ray Tracing) and Hidden Line elimination	T1: Ch 15
34-37	Perception of light and Color, Dithering	Light & Color Models (Light, half-toning, Color Models, Color Conversion & Interpolation, Dithering Matrix)	T1: Ch 13 R1: Ch 11
38-40	How to shade surfaces and solids	Rendering (Models, Physics, Shading Polygons & Surface, & Shadows)	T1: Ch 16 R1: Ch 11

Evaluation Scheme:

E.C.NO	Evaluation Component	Duration (minute)	Weightage (%)	Date & time	Nature of component
01	Midterm	90	30	13/10 - 9.30 - 11.00AM	Closed Book
02	Project		10	TBA	Open Book
03	Coding Assignments (10% pre mid sem	-	20	TBA	Open Book

	grading)				
04	Comprehensive	120	40	18/12 FN	Closed book

Chamber Consultation Hour: TBA

Notices: Will be displayed on the CMS. Specific instructions will be often given in the class only.

Makeup Policy: Makeup is highly discouraged for this course. Makeup will be given only in genuine cases and that too with prior notification only (following AUGSD rules). Makeup in Comprehensive Exam will be decided as per the guidelines issued by AUGSD.

Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

Instructor- in-charge
Tathagata Ray