BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI
HYDERABAD CAMPUS
SECOND SEMESTER 2019-2020
Course handout (Part II)

Date: 27/03/2020

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: Rogers B., "Mathematical elements of Computer Graphics", Tata McGraw Hill, 2002.
R2: D. Hearn and M.P. Baker, Computer Graphics: C Version, Pearson Education, 2002.
R3: N Krishnamurthy, "Introduction to Computer Graphics", 1st Ed., TMH, 2002.

Course Plan

L.No.	Learning Objectives	Topics to be covered	Chapter in the Text Book
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	Ch 1 Ch 4.4 Class Notes
04-07	Fast algorithms to draw Lines, Conic, And filled regions	Raster Graphics Algorithms for Drawing 2D objects: Lines, Circle, Ellipse, Parabola,	Ch 3.1-3.9

		Hyperbola, Polygon & Filled Closed Objects	
08-10	Concepts of 3D and OpenGL	Introduction to 3D- Graphics & 3D Coordinate Geometry and Introduction of OpenGL	Class Notes
11-13	How & why to manipulate objects	2D & 3D Scaling, Translation, Rotation, Shear, Reflection, Projection and Composite Transformations	Ch 5.1–5.3 Ch 5.5-5.8
14-16	Mapping 2D from World to Screen	Viewing & Clipping in 2D (Cohen's and Parametric Line Methods)	Ch 5.4 Ch 3.11-3.12
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	Ch 6
21-25	Drawing Smooth Curves & Surfaces	Hermite, Bezier, Continuities, Bspline Curves & Surfaces Rational Cubic Polynomial Curves & Quadric Surfaces)	Ch 11
26-28	Representation of Solid Objects	Solid Modeling (Representations, Operations, Geometry, and Interface)	Ch 12
29-33	Detection of Hidden portions	Visible Surface Detection (Need & Algorithms, Ray Tracing) and Hidden Line elimination	Ch 15
34-35	Perception of light and Color, Dithering	Light & Color Models (Light, half-toning, Color Models, Color Conversion & Interpolation, Dithering Matrix)	Ch 13
36-38	How to shade surfaces and solids	Rendering (Models, Physics, Shading Polygons & Surface, & Shadows)	Ch 16
39-40	How to show graphics in motion	Animation (Languages, Techniques, Control, Basic Rules & Problems)	Ch 21
41-42	Research Agenda	Applications of 3D Graphics in Visualization	Class Notes

Older Evaluation Scheme:

E.C.NO	Evaluation Component	Duration (minute)	Weightage (%)	Date & time	Nature of component
01	Midterm	90	20	4/3 9.00 - 10.30AM	Closed Book
02	In Class Quizzes		10	Each quiz is 1% worth and will be conducted in class. Almost 1 quiz/week. No makeups.	Closed Book
03	Project		10	Will be announced in class	Open Book
03	Coding Assignments	-	20	Will be announced in class	Open Book (take home)
04	Comprehensive	180	40	06/05 AN	Closed book

New Evaluation Scheme (after COVID-19 nationwide lockdown):

E.C.NO	Evaluation Component	Duration (minute)	Weightage (%)	Date & time	Nature of component
01	Midterm	90	20	4/3 9.00 - 10.30AM	Closed Book
02	In Class Quizzes		**5**	Each quiz is 1% worth and will be conducted in class. Almost 1 quiz/week. No makeups.	Closed Book
03	Project		10	Will be announced in class	Open Book
03	Coding Assignments	-	20	Will be announced in class	Open Book (take home)
04	Comprehensive	180	**45**	06/05 AN	Closed book

Chamber Consultation Hour: TBA

Notices: Will be displayed only on the CS&IS notice board and announced in class.

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 ID rules). In any case, the discretion to give makeup for any component except Comprehensive Exam lies with IC entirely.

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