Course Title: Engineering Techniques for Computer Graphics

Course Code: EE4208

Units: 3

Level: B4

Course Aims & Objectives:
The aim of this course is to introduce students to the field of Computer Graphics (CG). CG is concerned with the realistic and real time display of a simulated virtual world. CG finds practical applications in movie making, games, advertising, web page design, education, scientific visualization, virtual reality and many others.

In this course, students shall learn computer graphics concepts and techniques from an engineering viewpoint, with emphasis on analysis and software programming.

Intended Learning Outcomes:
On completion of this course, students will be able to:
1. Identify and apply suitable object representation techniques for building up a CG scene.
2. Apply coordinate transform and hierarchical structuring techniques to model complex objects and their interactions.
3. Distinguish and apply different viewing and projection techniques to convert a 3D scene into a 2D image.
4. Classify and compare various lighting and rasterization techniques.
5. Apply computer animation techniques to generate a CG movie with different motion effects.
6. Write a CG animation using a suitable graphics language.

Syllabus:
Introduction

Three Dimensional Object Representations
Boundary and Space Partitioning Representations such as Polygon Mesh, Splines, Superquadrics, Sweep Representation, CSG, Fractals, and Particle Physics.

Three Dimensional Geometrical and Modelling Transformation
Homogeneous coordinates. Linear transformations. Composite transformations.
Coordinate System Transformations. Hierarchy of Transformations and Level of Details.

Three Dimensional Viewing

Illumination Models and Surface Rendering
Visible Surface Detection
Back face culling. Z-buffer Algorithm; Ray Casting.

Animation
Key frame and parameterised systems; Morphing. Motion Simulation.

Teaching pattern:
Duration of course: 1 semester
Suggested lecture/tutorial/laboratory mix: Lecture Hour: 26
(Tutorial Hour*: 13
(Some Tutorials conducted in laboratory) *may be substituted with lecture/demonstration

Assessment pattern:
Examination duration: 2 hours, at the end of the semester
Percentage of coursework, examination, etc.: 40% CW; 60% Exam

For a student to pass the course, at least 30% of the maximum mark for the examination must be obtained.

Pre-requisites: (please quote course code & title)
MA2170 Linear Algebra and Multi-variable Calculus
and
EE2331 (old code CS2364) Data Structures & Algorithms

Pre-cursor: (please quote course code & title)
Nil

Exclusive Courses: (please quote course code & title)
CS4182 Computer Graphics or IT4301 Computer Graphics

Equivalent Courses: (please quote course code & title)
Nil

Equivalent to the Old Course Code & Title: (please quote course code & title)
IT4306 Engineering Techniques for Computer Graphics

Textbook:

References:


