|  |  |
| --- | --- |
| **Course-1 Title: Computer Graphics and Image Processing** |  |
| **Course No.: CIT-421 Credit : 3 Contact Hours: 3** | **Total Marks: 100** |

**11.1 Rationale**

Computer Engineers should be competent in computer graphics and image processing. They must learn the fundamental concepts of computer graphics and image processing. They must know the various computer graphics algorithms to draw the graphical representation of various geometric primitives. They must know how to process an image, image enhancement, pattern recognition, etc.

**11.2 Objectives**

To draw the graphical representation of objects, shapes of different objects. To transform objects and apply image processing in a given set of images.

|  |  |  |  |
| --- | --- | --- | --- |
| **11.3 Learning Outcomes** | **11.4 Course Content** | **11.5 Teaching  Learning Strategy** | **11.6 Assessment Strategy** |
| * Define computer graphics * Describe application areas of computer graphics * Design GUI | Introduction to Computer Graphics: Introduction, Presentation graphics, Application Areas, GUI; Graphics Hardware: Display devices Architecture and Input Devices. | * Lecture * Group Assignment | * Assignment |
| * Illustrate graphic primitives * Draw points, lines, circles, ellipse, etc. using algorithms * Explain inside-outside tests | Graphic Primitives: Drawing Points, Lines, Circles, Ellipse, Rectangles, Arcs; Polygons: Inside-outside tests, polygon fill algorithms, Character generation. | * Lecture * Case Studies * Assignment | * Exercise * Assignment |
| * Describe viewing pipeline * Illustrate window to view port transformation | Two-dimensional Viewing and Clipping: Viewing pipeline, Window to view port transformation, Point, Line, Polygon, Curve and Text clipping. | * Demonstration * Group Discussion | * Observation * Self-rating |
| * Illustrate transformations of objects * Describe rotations, scaling, reflection, shearing * Explain composite transformations | Transformations of Objects: Basic transformations, Affine Transformations, Translations, Rotations, Scaling, reflection and Shearing, Composite transformations matrices, Transformation of 3D objects (4´4 matrices). | * Lecture * Reading Assignment | * True or False * Multiple Choice |
| * Discuss the B-spline, Fractal geometry * Draw Bezier curves | Curve design: B-spline, Bezier curves and Surfaces, Fractal Geometry. | * Lecture * Group Assignment | * Completion * Assignment |
| * Illustrate 3D graphics pipeline * Classify different types of parallel and perspective metrices * Explain hidden lines and surface detection * Illustrate back face detection * Define Z-buffering | 3D Object Representation: 3D Graphics Pipeline, Projection: Different types of Parallel and Perspective Matrices; B-Rep, Constructive Solid Geometry, Hidden lines and Surface detection: Back face Detection, Painters algorithm, Z-buffering; light models. | * Lecture * Group Discussion | * Short Answer * Group Exercise |
| * Explain Ray-tracing * Describe different types of shading * Classify various types of color model | Rendering: Constant, Goraud and Phong shading; Ray-tracing; Different Types of Color Model. | * Lecture * Group Discussion | * Completion * Assignment |
| * Explain histograms * Discuss spatial operations * Illustrate image segmentation, image representation ,Image rectification, Image interpolation and other transformations * Illustrate edge detection ,boundary extraction and representation. | Image Processing : Introduction; Point operations; Line and Edge detection, labeling, Histograms; Spatial operations; Affine transformations; Image Segmentation, Image Representation and Modelling, Image rectification; Interpolation and other transformations; Contrast enhancement; Convolution operation, Magnification and Zooming; Fourier transform; Edge detection; Boundary extraction and representation; Mathematical morphology. | * Lecture * Group Discussion | * Short Answer * Group Exercise |
| * Discuss different types of pattern recognition techniques * Definer optical character recognition * Explain scene matching and analysis | Pattern Recognition: Statistical, Structural, Neural and Hybrid Techniques, Document Analysis and Optical Character Recognition, Object Recognition, Scene Matching and Analysis. | * Lecture * Group Discussion | * Completion * Assignment |

**RECOMMENDED BOOKS AND PERIODICALS**

**Text Books**:

1. R. A. Plastock & G. Kalley :"Theory and Problems of Computer Graphics"

2. Gonzaleg :"Pattern Recognition Principles"

**References:**

1. Steven Harrington :"Computer Graphics : A Programming Approach"

2. Newmann Sprocell :"Principles of Interactive Computer Graphics"