Course: MCA **Semester:** 5

Prerequisite: Knowledge of linear algebra, calculus and programming skills in C/C++.

Rationale: To provide the fundamental principles and algorithms of underlying computer graphics, including line drawing algorithms, circle/ellipse drawing algorithms, 2D geometrical transformation, 3D geometric transformations, viewing in 3D (orthographic projection and perspective projection) and visible surface detection algorithms.

Teaching and Examination Scheme

Teaching Scheme					Examination Scheme					Total
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Hrs/	Credit	Internal Marks			External Marks		
					T	CE	P	T	P	
3	0	2	-	4	20	20	20	60	30	150

SEE - Semester End Examination, **CIA** - Continuous Internal Assessment (It consists of Assignments/Seminars/Presentations/MCQ Tests, etc.)

Course Content

W - Weightage (%) , **T** - Teaching hours

Sr.	Topics	W	T
1	**Introduction and Basic Drawing Algorithms** Computer graphics and its applications, Raster-scan system, Random-scan system, Graphics primitives. **Basic Drawing Algorithms:** Line-drawing algorithms - DDA Algorithm, Bresenham's line algorithm. **Circle Generating Algorithms:** Midpoint circle algorithm, Bresenham's circle algorithm. **Ellipse-Generating Algorithm:** Midpoint ellipse algorithm.	**20**	**8**
2	**Region Filling Algorithms and Two-Dimensional Geometric Transformations** Attributes of output primitives, Line style, Colour and intensity, Area filling algorithm, Scan line and boundary fill algorithm, Flood fill algorithm, Antialiasing technique. **Two dimensional transformations:** Translation, Scaling, Rotation, Reflection, Sheering, Composite transformation, Transformation commands, Character generation.	**20**	**12**
3	**Viewing and Clipping** Viewing coordinates, Window view port, Clipping, Window to view port transformation, Line clipping algorithm - Cohen Sutherland, Polygon clipping - Sutherland Hodgman algorithm, 3D clipping - normalized view volume, View port clipping, Clipping in homogeneous coordinates.	**15**	**7**
4	**Illumination Model** Light sources, Diffuse reflection, Colour Models like RGB, YIQ, CMY, HSV. **3D Viewing**: 3D concepts, 3D display techniques, 3D representation, 3D transformation - transition, scaling, composite transformation, rotation about arbitrary axis. **Projection**: Parallel and perspective projection, Hidden surface and line removal, Back face removal, Depth buffer and scan line methods	**15**	**7**
5	**2D and 3D Animation Tools – Flash I** What is Multimedia, Animation, Introduction to Flash. **Flash Tools :** Selction, subselection, Free transform, Gradient transform,Line, lasso, Pen, Text , Oval, Rectangle, Pencil, Brush, Ink bottle, Paint bucket, Eyedropper and Eraser. **Flash Toolbars, Stage and Panels**. **Animation :** Frame by frame animation, Tweening :Motion tweening, Shape tweening, Character tweening. **Animation, Sound and Action Scripting – Flash II**: **Animation**: Masking and Layers **Sound** : Adding sound, Stop and Play sound, Importing sound files **Flash Scripting:** x (current x coordinate)**,** y (current y coordinate) **Timeline controls**: All Actions **Movie clip controls** :setProperty(), getProperty(), startDrag(), on (),stopDrag() **Browser / Network controls** : fscommand – quit , fullscreen, getUrl (),loadMovie(), fullscreen	**20**	**10**
6	**Working with MatLab** Overview, features and uses of MatLab.Understanding Matlab **Environment.MAtlab Basics :** Syntax, Variables, Naming conventions. Matlab Commands. Datatypes, Decision statements, Looping structures. Matlab Vectors, Matrix, Array. Matlab Numbers, Strings and Functions.	**10**	**4**

	Matlab Image Processing Functions:(imread(),imread(),imshow(),imwrite(),rgb2gray(),imhist(),imadjust(),im2bw(),uigetfile(),im2bw(),imcomplement(),edge(filename,method), imrotate(filename,angle),etc. Edge Detection using Canny Method, Rotate image clockwise and anti-clockwise.		

Reference Books

1.	**Computer Graphics (TextBook)** By Donald Hearn & M. Pauline Baker | PHI,2011 | Second Edition
2.	**Computer Graphics - a Programming approach** By S. Harrington | McGraw Hill,2014 | 2nd Edition
3.	**Principles of interactive computer graphics** By New Mann & Sprovl | McGraw Hill,2001 | 2nd edition
4.	**Procedural Elements for Computer Graphics** By David F. Rogers | Tata McGraw Hill,2001
5.	**Multimedia System Design** By Prabhat K. Andleigh & Kiran Thakur | PHI
6.	**Fundamentals of Multimedia** By Drew | Pearsons

Course Outcome

After Learning the Course the students shall be able to:

1. identify various components of graphics system.
2. implement algorithms for rendering basic shapes.
3. describe significance of projection, illumination models, viewing and clipping techniques.
4. implement various 2D and 3D transformation techniques and clipping algorithms.