PARUL UNIVERSITY - Faculty of IT & Computer Science

Department of Computer Application

SYLLABUS FOR 5th Sem B.Sc. (IT), BCA, IMCA, IMCA (A.Y.-IV) PROGRAMME

Computer Graphics (05101301)

Type of Course: B.Sc. (IT), BCA, IMCA, IMCA (A.Y.-IV)

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			Credit	Examination Scheme					Total
				External		Internal			
Lect Hrs/ Week	Tut Hrs/ Week	Lab Hrs/ Week		T	P	T	CE	P	
4	0	2	5	60	30	20	20	20	150

Lect - Lecture, **Tut** - Tutorial, **Lab** - Lab, **T** - Theory, **P** - Practical, **CE** - CE, **T** - Theory, **P** - Practical

Contents:

Sr.	Topic	Weightage	Teaching Hrs.
1	**introduction to computer graphics**: Application of computer graphics, Graphics Systems – Refresh CRT, Raster-Scan Displays, Random-Scan Displays, Flat Panel Displays, Liquid-Crystal Displays	10%	5
2	**Graphics Primitives**: Points and lines, Line-drawing algorithms – DDA Algorithm, Bresenham's line Algorithm; Circle-generating algorithm – Midpoint Circle Algorithm, Filled-Area Primitives : Scan-line Polygon Fill Algorithm, Inside-outside Tests, Boundary-Fill Algorithm	16%	7
3	**2D and 3D transformation**: Basic transformations – Translation, Rotation, Scaling; Matrix representations & Homogeneous Coordinates; Composite transformations, Other Transformations – Reflection, Shear; 3-D transformations	16%	7
4	**Two Dimensional Viewing**: Viewing Pipeline, Window-to-viewport coordinate transformation; **Clipping:** Point Clipping; Line Clipping – Cohen-Sutherland Line Clipping, Liang-Barsky Line Clipping; Polygon Clipping – Sutherland-Hodgeman Polygon Clipping; Text clipping	16%	6

5	**Image Operations & Image Representation**: Graphics Formats (GIF (Graphics Interchange Format), Microsoft Windows Bitmap (BMP), JPEG File Interchange Format, MPEG, TIFF (Tag Image File Format), PNG (Portable Network Graphic Format)) Introduction, applications and components of Image processing system, Digitization: Sampling & Quantization Image Enhancement: Contrast Intensification (with examples) and smoothing (with examples), Sharpening and noise reduction. Introduction of Image restoration, Image compression (Lossy & Loss-less compression), Image Registration, MultiValued Image processing (Multi-spectral & Multi-modal), Image analysis (Segmentations, Edge & Line detection, Feature extraction, Image description & Recognition	14%	6
6	**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.	10%	6
7	**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	10%	6
8	**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. **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.	8%	5

***Continuous Evaluation:**

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

Reference Books:

1. Computer Graphics
   Donald Hearn & M. Pauline Baker; PHI,2011; Second Edition
2. Computer Graphics - a Programming approach
   S. Harrington; McGraw Hill,2014; 2nd Edition
3. Principles of interactive computer graphics
   New Mann & Sprovl; McGraw Hill,2001; 2nd edition
4. Procedural Elements for Computer Graphics
   David F. Rogers; Tata McGraw Hill,2001
5. Macromedia FLASH 8 advanced for Windows and Macintosh
   Chun Robertson; Pearson Education,2005
6. Adobe Flash Professional CS6 Classroom in a book
   ; Pearson (Adobe Press)
7. Adobe Flash CS4 Professional
   Robert Reinhardt, Snow Dowd; Bible; Willy India Edition
8. Digital Image Processing using MATLAB
   Gopi,E.S.; SCITECH PUBLISHING (INDIA) PVT. LTD. ,
9. Digital Image Processing using MATLAB
   Gonzalez, Rafael C. , Woods, Richard E., Eddins, Steven L.; Dorling Kindersley (India) Pvt. Ltd. ,
10. MATLAB : PROGRAMMING FOR ENGINEERS
    Chapman, Stephen J .,; Thomson Asia Pvt Ltd ,

Course Outcome:

After Learning the course the students shall be able to:

1. Identify various component of graphics system
2. Implement algorithms for rendering basic shapes
3. Understand various graphics formats, viewing and clipping techniques and digitization of Images
4. Implement various 2D and 3D transformation techniques and clipping algorithms
5.Able to use and Implement simple MATLAB functions and equations for Image processing.

List of Practical:

1. Create an animation to show

   1. Motion Tween
   2. Shape Tween
   3. Character Tween

2. Create an Alphabet Set Animation.

3. Create a sun using frame by frame animation.

4. Create an animation which shows masking effect on a building.

5. Create an animation to show a ball moving on a specific path using Guide layer.

6. Create an animation showing a plant growing from a pot and a butterfly sitting on it using different scenes.

7. Create an animation based on the theme of Uttarayan/Holi.

8. Create an e-card for New Year celebration.

9. Create an animation showing a glass getting filled with water.

10. **Create an animation movie based on Car race.**

    (Note: Make the use of Movie clip for the wheels of the car.)

11. **Create an animation showing the Solar System and its different planets.**

12. **Create an Login application, accepting user id and password from the user and displaying appropriate messages.**

13. **Create an application performing simple mathematical calculations.**

14. **Create two scenes: In one scene import any image related to computer. Provide button as: What is Computer. By clicking on it, display the definition of computer which is written on frame 1 of scene 2.**

15. **Create a flash application which takes input from user and calculate net salary and display it.**

    Accept Basic salary, DA, HRA, CLA, TA, MA, PF and PT from the user. For calculation of net salary use following formulae:

    Net Salary = Basic Salary + DA + HRA + CLA + TA + MA – PF – PT

16. **Take the text input from user. Create three buttons as: Display, Clear & Exit.**

    On clicking ‘Display’ button: it displays the enter message in another text box.

    On clicking on ‘Clear” button: it clears the content of entered text value.

    On clicking on ‘Exit’ button: it terminates the application.

17. **Create the exe which shows**

    Scene1: show sun rise from back of the mountain and birds flying

    (make use of gradient and gradient transform tool)

    Scene 2 : show masking effect.

18. **Create an Digital clock animation.**

19. **Create the EXE and run in full screen mode. Create the movie with the scenes as below:**

    scene1: “WELCOME” AND CREATED BY: “YOUR NAME” gives the effects of your choice and a button to go to index.

    Scene2: index with the title scene1 and scene3. Clicking on a particular scene should run only that scene and there should be button to go back to the index in each scene.

20. **Create two animated buttons if you click first button then animation should jump to 12th frame of second scene & If you press second button then animation should jump to 8th frame of third scene.**

21. Create two scenes. In scene 1: Take two input values a & b. Provide four buttons for +,-,* and / operators. By clicking on any one operator, display the appropriate answer in a text box which is on scene 2. Also provide the button to come back on scene 1.

22. Create an application which follows a hierarchy as below:

Scene 1: Accepts User Name and Password. If they are correct then, traverse them to next scene/file.

Scene 2: It has 2 options (Hill Station, Beach). As the option is selected, we traverse them to the next scene.

Scene 3: According to the selected option, there should be a link for explanation. When clicked on it, the explanation for the same should be displayed.

Each and every scene should contain back, home and Quit buttons.

23. Installation of MatLab

24. Implementation of Matlab Commands and Functions on Image Processing (All commands as per syllabus)