Government Holkar (Model, Autonomous) Science College, Indore (M.P.)

Computer Science Department

Part A - Introduction				
Programme – B.C.A. (Computer Applications - Major)		**Class** – B.C.A. V Semester	**Year-** 2024	**Session-** 2024-25
Course Type (Computer Applications) Major				
1	**Course Code**	S5-BCAIT		
2	**Course Title**	Computer Graphics		
3	**Pre – requisite (if any)**	-		
4	**Course Learning Outcomes (CLO)**	**On successful completion of this course, the students will be able to:** 1. Recall and define the fundamental concepts and techniques used in computer graphics, such as scan conversion, transformations, and shading. 2. Explain the significance of various components in a graphic system and how they relate to creating visual output, including input devices, output devices, and display processors. 3. Implement scan conversion algorithms for lines and circles and create 2D graphics applications wit21w3221h interactive transformations. 4. Assess the efficiency of different polygon filling and clipping algorithms, and evaluate the impact of shading techniques on the realism of 3D graphics. 5. Critique the strengths and weaknesses of hidden surface removal algorithms and compare their performance in different scenarios. 6. Design and develop complex 2D and 3D graphics applications, generate animations for specific purposes, and create software tools for various computer graphics tasks.		
5	**Credit Value**	4 Credits		
6	**Total Marks**	Formative Assessment (CCE) – 40 Marks Summative Assessment (End Semester Exam) – 60 Marks **Total 40+60= 100 Marks**	**Minimum Pass Marks – 35**	

Mr. Mohit Gupta	Mr. Manish Kumar	Dr. Ugrasen Suman	Dr. Sharad Gangele	Dr. Sanjeev Sharma	Dr. Pradeep Sharma
Student	Industrial Person	Subject Expert	Subject Expert	Subject Expert	Convener & HoD
Clause 06	Clause 05	Clause 04	Clause 03	Clause 03	

Part A - Introduction			
Programme – B.C.A. (Computer Applications - Major)	**Class** – B.C.A.V Semester	**Year**- 2024	**Session**- 2024-25
Course Type (Computer Applications) – Major			
Course Code	S5-BCA1T		
Course Title	Computer Graphics		

Part – B Content of the Course		
Total no. of lectures – As per UGC rules (1 Credit = 15 Lectures)		
S. No.	**Topics**	**No. of Lectures**
I	Introduction to Computer Graphics: Application of Computer Graphics, Interactive and Passive Graphics. Graphic Systems: Display Processor, Cathode Ray Tube (CRT), Random Scan vs. Raster Scan, Color CRT Monitors, Direct View Storage Tubes, Flat Panel Display. Input Devices: Keyboard, Mouse, Trackball, Light Pen, Scanner, Image Scanner. Output Devices:Monitor, Printer, Plotter, and Speaker.	12
II	Scan Conversion a line: Scan Conversion Definition, Scan Converting a Point, Scan Converting a Straight Line, DDA Algorithm. Scan Conversion Circle: Defining a Circle, Defining a Circle using Polynomial Method, Defining a Circle using Polar Coordinates Method, Bresenham's Circle Algorithm, Midpoint Circle Algorithm. Scan Converting Ellipse: Scan converting an Ellipse, Polynomial Method, Trigonometric Method, and Midpoint Ellipse Algorithm.	12
III	Filled Area Primitives: Boundary Fill Algorithm, Flood Fill Algorithm, Scan Line Polygon Fill Algorithm. 2D Transformations: Introduction of Transformation, Translation, Scaling. Rotation, Reflection, Shearing, Matrix Representation, Homogeneous Coordinates, Composite Transformation, Pivot Point Rotation. 2D-Viewing: Window, Window Transformation, Zooming, Panning.	12

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IV	Clipping Techniques: Clipping, Point Clipping. Line Clipping, Midpoint Subdivision Algorithm, Text Clipping, Polygon, Sutherland- Hodgeman Polygon Clipping, Weiler-Atherton Polygon Clipping. Pointing & Positioning: Pointing & Positioning Techniques, Elastic or Rubber Band Techniques, Dragging. Shading: Introduction of Shading. Constant Intensity Shading, Gouraud Shading, Phong Shading.	12
V	Animation: Animation, Application Areas of Animation, Animation Functions. 3D Computer Graphics: Three Dimensional Graphics, Three Dimensional, Transformations, Scaling, Rotation, Rotation about Arbitrary Axis, Inverse, Transformations, Reflection, Shearing. Hidden Surfaces: Hidden Surface Removal, Back Face Removal Algorithm, Z-Buffer Algorithm, Painter's Algorithm, Scan Line Algorithm, Subdivision Algorithm.	12

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Course Code	S5-BCA1T		
Course Title	Computer Graphics		

Part – C Learning Resources

Text Books, Reference Books, Other Resources

Suggested Readings:

Text Books:

1. Hearn: Computer Graphics C Version, Pearson Education India; 2nd edition, 2002.
2. John Hughes, Andries van Dam, Morgan McGuire, David Sklar, James Foley: Computer Graphics: Principles and Practice, Addison-Wesley Professional, 3rd edition, 2013.
3. Zhigang Xiang, Roy Plastock: Computer Graphics, McGraw Hill Education, 2nd edition, 2006
4. Books published by M.P. Hindi Granth Academy, Bhopal.

Reference Books:

1. James D. Foley, Andries van Dam, Steven K. Feiner, John F. Hughes: Introduction to ComputerGraphics, Addison Wesley, 1993.
2. Chopra Dr. Rajiv: Computer Graphics, S Chand & Co Ltd.
3. Desai: Computer Graphics, PHI, 2008.
4. Asthana, R.G.S.: Computer Graphics for Scientists and Engineers, New Age International Pvt Ltd.

Suggested Digital Platforms Web Links:

1. https://www.eshiksha.mp.gov.in/mpdhe
2. https://epgp.inflibnet.ac.in

Suggested Equivalent Online Courses:

1. https://nptel.ac.in/courses/106103224
2. https://nptel.ac.in/courses/106106090

Part A - Introduction			
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Course Code	S5-BCA1T		
Course Title	Computer Graphics		

Part – D Assessment and Evaluation				
Internal Assessment: Continuous Comprehensive Evaluation (CCE)/ Formative Assessment: 40 Marks Formative Assessment shall be based on – Quiz, Seminar, Presentation, Written test, Case Study, Project, Assignment etc. The division of marks is as follows:			**External Evaluation (Summative Assessment):** **End Semester Exam:60 Marks** Time: 03 hours	
Test I	20 Marks	Best two test Marks = (20 + 20)	**Section (A):** 5 Objective Questions (1 mark each)	5 x 1= 5
Test II	20 Marks		**Section (B):** 5 Short Questions out of eight questions (200 words each) (7 Marks each)	5 x 7 = 35
Test III	20 Marks		**Section (C):** Two long questions out of four questions (500 Words each) (10 Marks each)	2 x 10 = 20
Total Internal Assessment (CCE) Marks		**40 Marks**	Total External Evaluation (Theory) Marks (A+B+ C)	**60 Marks**
Note:	**1.**	**For Major, Minor, Open Elective, Foundation and Vocational Courses, Part D will be as per the scheme of marks given.**		
	2.	**The student should secure 35% marks in Internal Assessment (CCE) and External Evaluation (theory) combined.**		

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Computer Science Department

Part A- Introduction (Practical)

Programme – B.C.A. (Computer Applications - Major)	**Class** – B.C.A. V Semester	**Year**- 2024	**Session**- 2024-25

Course Type (Computer Applications) Major

1.	Course Code	S5-BCA1TP
2.	Course Title	Computer Graphics Lab
3.	Pre-requisite (if any)	-
4.	Course Learning Outcomes (CLO)	**On successful completion of this course, the students will be able to:** 1.Understand fundamental concepts in computer graphics, distinguish various graphics systems, and identify practical uses of computer graphics. 2.Explain and compare algorithms utilized for scan conversion and filling of basic shapes, emphasizing their strengths and weaknesses. 3.Apply geometric transformations to manipulate graphic objects and demonstrate their utilization in a composite context. 4.Analyze different clipping methods for extracting scenes and assess how they transform content for display on a graphics device. 5.Create 3D projections and employ techniques for detecting visible surfaces to enable the display of 3D scenes on a 2D screen. 6.Evaluate the rendering of projected objects to achieve a naturalized 2D view and assess the effectiveness of illumination models in this context.
5.	Credit Value	2 Credits
6	**Total Marks**	Formative Assessment (CCE) – 40 Marks Summative Assessment (End Semester Exam) – 60 Marks **Total 40+60= 100 Marks**
		Minimum Pass Marks – 35

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Clause 06	Clause 05	Clause 04	Clause 03	Clause 03	

Part B- Content of the Course	
Total no. of lectures – As per UGC rules	
Suggestive List of Practicals	
1.	Write a program to draw basic graphics construction like line, arc, ellipse and rectangle.
2.	Write a program of translation, Rotation and Scaling using Composite Transformation.
3.	Write a program to draw a Circle using midpoint implementation method.
4.	Write a program to draw Bezier curve.
5.	Write a program to rotate a triangle about its midpoint.
6.	Write a program to clip a line using Liang Barsky Method.
7.	Write a program to implement standard Perspective projection in 3-Dimensions.
8.	Write a program to implement parallel projection in 3-Dimensions.
9.	Write a program to implement a digital clock.
10.	Write a program to draw animation using increasing circles filled with different colors and patterns.
11.	Write a program to control a ball using arrow keys.
12.	Write a program to implement Bouncing ball in vertical direction.

Part – C Learning Resources

Text Books, Reference Books, Other Resources

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Part D- Assessment and Evaluation	
Suggested Continuous Evaluation methods:	
Internal Assessment/Formative Examination(A):	**40 Marks**
Lab Record	15 Marks
Attendance in the Lab	05 Marks
Assignments (It can be in different modes)	20 Marks
End Semester External Evaluation (B):	**60 Marks**
Viva Voce on Practical	10 Marks
Practical Record File	10 Marks
Experiments	40 Marks
Total Marks (A+B)	**(40 + 60 =100 Marks)**