



Gyanmanjari
Innovative University

Course Syllabus
Gyanmanjari College of Computer Application
Semester-7 (BCA)

Subject: Computer Graphics – BCAXX17408

Type of course: Minor Stream

Prerequisite: Basic knowledge of computers and programming, along with a little understanding of math's (like shapes and calculations). Students should also have good thinking and problem-solving skills to understand and create computer graphics easily.

Rationale:

This course equips students with the skills to understand and create visual content using computers. It covers graphic design principles, image processing, 2D and 3D transformations, and rendering techniques through both theoretical and practical learning. Students learn to design, develop, and analyze graphical applications, as well as apply visualization techniques to solve real-world problems. The course prepares learners for careers in areas such as animation, game design, multimedia, and user interface development.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
CI	T	P		C	SEE		CCE		
			Theory		Practical	MSE	LWA	ALA	
3	0	2	4	75	25	30	20	50	200

Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; SEE - Semester End Evaluation; MSE- Mid Semester Examination; LWA - Lab Work Assessment; V – Viva voce; CCE-Continuous and Comprehensive Evaluation; ALA- Active Learning Activities.

3 Credits * 25 Marks = 75 Marks (each credit carries 25 Marks) Theory

1 Credits * 25 Marks = 25 Marks (each credit carries 25 Marks) Practical

SEE 100 Marks will be converted in to 50 Marks

CCE 100 Marks will be converted in to 50 Marks

It is compulsory to pass in each individual component.



Course Content:

Sr. No	Course content	Hrs	% Weightage
1	Introduction to Computer Graphics <ul style="list-style-type: none"> • Introduction to Computer Graphics • Applications of Computer Graphics • Graphics Systems and Models • Raster Scan and Random Scan Displays • Display Devices (CRT, LCD, LED) • Input Devices (Mouse, Light Pen, Joystick) • Overview of Graphics Software 	10	20%
2	Graphics Primitives & Algorithms <ul style="list-style-type: none"> • Basic Graphics Primitives (Point, Line, Circle) • DDA Line Drawing Algorithm • Bresenham's Line Drawing Algorithm • Midpoint Circle Algorithm • Polygon Representation • Filled Area Algorithms 	10	20%
3	2D Transformations <ul style="list-style-type: none"> • Position Translation • Object Rotation in Transformation • Size Scaling • Composite Transformations • Homogeneous Coordinates • Mirror Reflection Transformation • Shear Transformation Effect • Window to Viewport Transformation 	8	20%



4	<p>Clipping & 3D Graphics</p> <ul style="list-style-type: none"> • Clipping Concepts • Cohen-Sutherland Line Clipping Algorithm • Liang-Barsky Algorithm • Polygon Clipping • Introduction to 3D Graphics • 3D Transformations • 3D Viewing Pipeline 	9	20%
5	<p>Advanced Topics in Computer Graphics</p> <ul style="list-style-type: none"> • Projection Techniques (Parallel and Perspective) • Visible Surface Detection • Illumination Models • Introduction to Animation • Multimedia and Graphics Standards • Basics of OpenGL 	8	20%

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1	<p>Growth of Computer Graphics: From Origin to Modern Era: Students are required to prepare a document on “Growth of Computer Graphics: From Origin to Modern Era”, covering its history, evolution, and modern applications such as gaming, animation, and virtual reality. The report should include a brief introduction, major developments, relevant examples, and a short conclusion with proper headings. The completed document must be uploaded to the GMIU Web Portal.</p>	10
2	<p>Review Paper on Computer Graphics: Students are required to prepare a review paper on any topic related to the field of computer graphics, technologies, or tools. The paper should include an overview of the selected topic, its concepts or working principles, recent developments, advantages, limitations, and real-world applications. The completed review paper must be uploaded to the GMIU Web Portal.</p>	10
3	<p>GraphiQuest : In this activity, students are required to attempt a quiz based on the Computer Graphics subject. The quiz will include questions related to algorithms, graphics tools, and the latest technologies. This activity aims to evaluate students’ understanding and knowledge of fundamental and advanced concepts in computer graphics.</p>	10



4	<p>Poster Making Students are required to create a poster using any computer graphics tool such as Canva, PowerPoint, or Photoshop. The topic must be unique and related to computer graphics, presented using images and short points. The poster should be creative, neat, and easy to understand, avoiding lengthy paragraphs. The final poster, along with a brief description (100–150 words), must be uploaded to the GMIU Web Portal.</p>	10
5	<p>Creating a Simple Animation Using Graphics Tool Students are required to create a short animation (5–10 seconds) using any free tool such as Blender, Krita, or Pencil2D. The animation should be simple (e.g., a moving object) and demonstrate basic animation concepts. Students must submit the video along with a brief description of the tool used and upload the document to the GMIU Web Portal.</p>	10
Total		50

Suggested Specification table with Marks (Theory):75

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	25%	35%	15%	15%	0	10%

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcome:

After learning the course the students should be able to:	
CO1	Understand the basic concepts, components, and applications of computer graphics along with different display devices, input devices, and graphics systems used in real-world applications.
CO2	Apply fundamental graphics primitives and implement basic drawing algorithms like DDA and Bresenham to create and fill basic shapes using graphical techniques.
CO3	Develop and apply various 2D transformations such as translation, rotation, and scaling to manipulate objects using transformation techniques and coordinate systems.
CO4	Analyze clipping techniques and algorithms to display only visible parts of objects and understand the basics of 3D graphics, transformations, and the 3D viewing process.



CO5	Recognize advanced concepts like projection, illumination, and animation along with basic knowledge of modern graphics tools and standards such as OpenGL and multimedia systems.
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List of Practical

Sr. No	Descriptions	Unit No	Hrs
1	Study and understand different computer graphics tools and software (e.g., Blender, OpenGL).	1	2
2	Study and understand basic computer graphics technologies and their applications.	1	2
3	Write a program to draw a line using DDA Algorithm.	2	2
4	Write a program to draw a line using Bresenham's Line Algorithm.	2	2
5	Write a program to draw a circle using Bresenham's Circle Algorithm.	2	2
6	Create a 3D object using a graphics tool (e.g., Blender/OpenGL).	3	4
7	Write a program to demonstrate color models (RGB) using graphics functions.	3	2
8	Create a logo of your name using a graphic tool.	2	2
9	Write a program to draw a smiley face using graphics functions.	2	2
10	Create a small animation using any graphic tool.	3	2
11	Write a program to implement polygon clipping.	4	2
12	Write a program to perform 2D transformations (translation, rotation, scaling).	4	4
13	Write a program to display different line styles (solid, dotted, dashed).	4	2
Total			30

Instructional Method:

The course delivery method will depend upon the requirement of content and the needs of students. The teacher, in addition to conventional teaching methods by black board, may also use any tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc. From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory.



The internal evaluation will be done on the basis of Active Learning Assignment.

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in the laboratory.

Reference Books:

- [1]. Computer Graphics C version - 2014 - Donald heram and M. Pauline Baker - Published by : Dorling kindredly (india) PVR. Ltd, Licensees of pearson Education in South Asia
- [2]. Computer Graphics using OPENGL. Third Edition - 2010 - F.S.Hill, Jr.and Stephen M. Kelley,jr.(Dept of Computer Engineering University of Massachusetts) - Published BY: PHI learning Private Limited
- [3]. Computer Graphics and Multimedia - Second Edition - 2007 - Anirban Mukhopadhyay and Arup Chattopadhyay - Published By : Vikas Publishing House PVT.LTD
- [4]. Introduction to Computer Graphics - Version 1.4, August 2023 - David J. Eck Hobart and William Smith Colleges
- [5]. Computer Graphics - Samit Bhattacharya - Department of Computer Science Engineering IIT Guwahati - OXFORD University Press

