



GOVERNMENT POLYTECHNIC, AMRAVATI

(AN AUTONOMOUS INSTITUTE OF GOVT. OF MAHARASHTRA)

CURRICULUM DEVELOPMENT CELL

CURRICULUM 2023 (FIFTH REVISION)

PROGRAMME TITLE: DIPLOMA IN COMPUTER ENGINEERING

COURSE CODE: CM4502

COURSE TITLE: COMPUTER GRAPHICS

LEARNING SCHEME:

LEVEL OF COURSE	PRERE- QUISITE	Total IKS HRS	WEEKLY CONTACT HRS.			WEEKLY SL HRS.	TOTAL CREDITS	TOTAL WEEKS	TOTAL CONTACT HOURS		
			CL	TL	LL				CL	TL	LL
IV	-	-	01	00	02	03	03	15	15	00	30

ASSESSMENT SCHEME:

PAPER DURATION (HRS)		THEORY-CL (Marks)				PRACTICAL-LL (Marks)		SELF LEARNING- SLA (Marks)	TOTAL (Marks)
TH- FA	TH- SA		TH -FA	TH-SA	TOTAL	PR- FA^	PR-SA		
-	-	MAX	---	---	---	25	25#	25	75
		MIN.	---	---	---	10	10	10	-

Abbreviations: CC—Common Course, FC – Fractional Course, ME – Mechanical Engineering (Programme Specific Course), IKS- Indian Knowledge System, CL – Classroom Learning, TL –Tutorial Learning, LL – Laboratory Learning, SL – Self Learning, FA – Formative Assessment, SA – Summative Assessment, TH – Theory, PR – Practical, SLA – Self Learning Assessment. **Legends:** @ - Internal Assessment, # - Internal & External Assessment, \$ - Online MCQ Examination, * - FA-TH 30 Mark constitutes two parts one is 20 marks for Formative Assessment Test and other is 10 marks for Tutorial Learning Assessment. ^ - Under practical FA, Continuous Assessment of Practical Work is to be done by Course Teacher as per CDC norms and rubrics.

Note: 1. Under the Theory FA, final marks are the Average of Two FA Tests to be conducted as per academic calender of the term.

2. Question paper for TH-FA and TH-SA shall be set as per CDC norms and specification table.

Under the head SL Assessment, Assignment, Micro Activity, Presentation, Seminar, related to course is to be assessed by course teacher as per CDC norms and rubrics.

3. PR-SA to be conducted with practical based individual performance and related viva.

1. RATIONALE:

Computer graphics refers to the field of visual computing where images, videos, and animations are created, manipulated, and rendered using computers. Computer graphics is a complex and diversified technology. To use images, pictures in any systems one needs the understanding of generation, editing, processing and conversion of it into other types of images. Computer graphics techniques can be used in many fields such as engineering drawing, business graphs, architectural design and also for video games, which provides a new form of entertainment.

2. COURSE OUTCOMES (COs):

At the end of this course, student will be able to: -

1. Identify the file structure of display graphics file formats..
2. Apply the algorithms to draw lines, circle and polygons.
3. Perform and demonstrate basic and composite graphical transformations on given object.
4. Implement Various Clipping algorithms and given curve generating algorithms.

3. DETAILED CONTENTS: THEORY-CL

Unit / CO No	Major Learning Unit Outcomes (in cognitive domain)	Topics and Sub-topics	Hrs	Marks
Unit I / CO1 Basics of CG	1.1 Describe coordinate system. 1.2 Select and use various graphics file formats. 1.3 Use different graphics functions and standards.	1.1 Coordinate system 1.2 Graphics file formats: Basics, advantages, disadvantages – BMP – GIF – JPEG – TIFF – PCX 1.3 Graphics functions: Text mode, Graphic mode, Shapes, Colors.	2	-
Unit II / CO2 Raster Scan Graphics	2.1 Apply Line Drawing algorithms to generate Line. 2.2 Apply Circle Drawing algorithms to generate Circle. 2.3 Apply Polygon Filling algorithms to Fill Polygon.	2.1 Line Drawing Algorithms: Digital Differential Analyzer algorithm, Bresenham's algorithm. 2.2 Circle Generation- Symmetry of Circle, Bresenham's algorithm 2.3 Polygon Filling : Seed Fill algorithms- Flood Fill algorithm, Boundary Fill algorithm.	4	-
Unit III / CO3 Overview of 2D and 3D Transformations	3.1 Perform various transformations on given graphics object. 3.2 Use composite transformations. 3.3 Write need of homogeneous coordinates.	3.1 Basic Transformations: Translation, Scaling, Rotation. 3.2 Matrix representations & homogeneous coordinates. 3.3 Composite transformations: Rotation about an arbitrary Point. 3.4 Three-dimensional transformation.	4	-

Unit IV / CO4 Windowing, Clipping Techniques, Curves and Projections	4.1 Define: Windowing and Clipping. 4.2 Apply Clipping algorithms for Line and Polygon. 4.3 Draw various Curves using Curve generation algorithms. 4.4 Identify different types of Projections.	4.1 Windowing & Clipping Concepts. 4.2 Line Clipping: Cohen Sutherland Line Clipping algorithm, Mid-Point Subdivision Line clipping algorithm. 4.3 Polygon Clipping: Sutherland Hodgeman Polygon clipping algorithm. 4.4 Bezier and B-Spline Curves. 4.5 Projections: Perspective and Parallel Projection and its types.	5	-
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4. LIST OF PRACTICALS-LL

S.No	PRACTICAL LEARNING OUTCOMES (PLOs)	CO NO.
1. *	Write a C program to draw various graphics objects (Pixel, Circle, Line,) using graphics functions.	CO1
2.	Write a program to draw following graphics objects using built in “C” functions. Ellipse, Rectangle, Triangle, Polygon	CO1
3. *	Write a C program to draw line using DDA algorithm.	CO2
4.	Write a C program to draw line using Bresenham’s algorithm.	CO2
5. *	Write a C program to draw circle using Bresenham’s algorithm	CO2
6. *	Write a C program for Flood fill algorithm of polygon filling	CO2
7.	Write a C program for Boundary fill algorithm of polygon filling.	CO2
8. *	Write a C program for 2D Translation and Scaling.	CO3
9.	Write a C program for 2D Rotation.	CO3

10.	Write a C program for 2D Rotation about an arbitrary Point.	CO3
11. *	Write a C program for 3D Translation and Scaling .	CO3
12.	Write a C program for 3D Rotation.	CO3
13. *	*Write a C program for Line Clipping using Cohen-Sutherland algorithm.	CO4
14.	Write a C program for Line Clipping using Midpoint Subdivision algorithm.	CO4
15.	Write a C program for Sutherland Hodgeman Polygon Clipping.	CO4
16. *	Write a C program for Bezier Curve.	CO4

(Practicals marked as * are compulsory)

Note :

- i. A suggestive list of *PLOs* is given in the above table. More such *PLOs* can be added to attain the COs and competency. A judicious mix of minimum 12 or more practical need to be performed, so that the student reaches the 'Precision Level' of Dave's 'Psychomotor Domain Taxonomy' as generally required by the industry.
- ii. The 'Process ' and 'Product ' related skills associated with each PLO is to be assessed according to CDC norms and rubrics.
- iii. The above *PLOs* also comprise of the following social skills/attitudes which are Affective Domain Outcomes (ADOs) that are best developed through the laboratory /field based experiences:
 - a. Follow safety practices.
 - b. Practice good housekeeping.
 - c. Practice energy conservation.
 - d. Handle equipments carefully.
 - e. Plan for development of a program.
 - f. Demonstrate working as a leader / a team member.
 - g. Maintain hardware, tools and equipment.
 - h. Follow ethical practices.

The ADOs are not specific to any one *PLOs*, but are embedded in many *PLOs*. Hence, the acquisition of the ADOs takes place gradually in the student when s/he undertakes a series of practical experiences over a period of time. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

- 'Valuing Level' in 1st year
- 'Organizing Level' in 2nd year and
- 'Characterizing Level' in 3rd year

5. SUGGESTED STUDENT SELF LEARNING ACTIVITIES:

Other than the classroom and laboratory learning, following are the suggested student-related **co-curricular** activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct at least **01 group activity and 01 individual activities** (*to be continued throughout the term*). For the following suggested activities prepare reports of about 5 pages for each activity, also collect/record physical evidences for student's portfolio which will be useful for their placement interviews:

- Students should prepare report on any micro activity related to course on different units as per the guidance of course teacher.
- Prepare assignments on different units as per the guidance of course teacher
- Prepare lab manual based on practical performed in laboratory.
- Give seminar on relevant topic.
- Library/E-Book survey regarding related course and prepare assignments on it for the course.
- Prepare power point presentation or animation for demonstrating emerging activities/technology in the course.
- Visit to institute/industry and prepare report.
- Develop learning materials, models, charts related to topic, course.
- Develop applications/ activities related to course which may be useful to society.
- Learning through various online platforms such as SWAYAM, Infosys Springboard, Spokentutorials etc. related to course.

6. SUGGESTED INSTRUCTIONAL STRATEGIES

These are sample strategies, which the teacher can use to accelerate (if required), the attainment of the various outcomes in this course:

- About **10-15% of the topics/sub-topics** which is relatively simpler or descriptive in nature is to be given to the students for self-directed learning and assess the attainment of COs through classroom presentations.
- Use the proper equivalent analogy to explain different concepts.
- Use simulators/Animation/Online Videos/Field Visits/ Expert Lectures for the understanding of concept.

7. MAJOR EQUIPMENTS / INSTRUMENTS REQUIRED

Sr No.	Equipment Name with Broad Specification	Practical No.
1	Computer System with basic configuration.	01-16
2	'C' Compiler	01 TO 16

8. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

NA





9. QUESTION PAPER PROFILE




NA

10. SUGGESTED LEARNING RESOURCES

SR.NO.	TITLE	AUTHOR	PUBLISHER
1.	Computer Graphics	Donald Hearn , M Pauline Baker	Prentice-Hall • ISBN-10 : 0131615300 • ISBN-13 : 978-0131615304
2.	Computer Graphics	Atul P. Godse, Dr. Deepali A. Godse	Technical Publications ISBN 933322338X, 9789333223386
3.	Principles of Interactive Computer Graphics	William M. Newman Robert F. Sproull	McGraw-Hill • ISBN: 978-0- 07-046338-7
4.	Computer Graphics	Zhigang Xiang, Roy Plastock	Schaum O Series • ISBN: 9789389538847 • ISBN: 938953884X

11. SOFTWARE/LEARNING WEBSITES.

Sr.No	Website	QR code	Content
1	https://www.javatpoint.com/computer-graphics-programs		Basic graphics programs
2	https://www.tutorialspoint.com/computer_graphics/index.htm		Basics of computer graphics
3	https://www.javatpoint.com/computer-graphics-clipping		Line drawing algorithm
4	https://www.javatpoint.com/computer-graphics-clipping		Clipping Algorithms

5	https://www.tutorialspoint.com/computer_graphics/computer_gr		Curves in computer graphics
6	https://www.tutorialspoint.com/computer_graphics/2d_transfor		2D and 3D Transformation
7	https://infyspringboard.onwingspan.com/web/en/app/toc/lex_au		Project on Computer Graphics

12. CO-PO MAPPING

CO	PO1 Basic and Discipline knowledge	PO2 Problem analysis	PO3 Design and developme nt of solution	PO4 Engineeri g tools an experimen tal and testing	PO5 The Engineer practices for Society	PO6 Project manag ement	PO7 Lifelo ng learn ing	PSO1 Logic develop ment and Implementa tion	PSO2 Entrepre neurship
1. Manipulate Visual and Geometric information of Images	2	2	2	2	1	1	1	3	2
2. Develop programs in C applying standard graphics algorithms.	2	2	2	2	-	1	1	2	-
3. Perform and Demonstrate basic and composite graphical transformations on given object.	2	2	2	2	-	1	1	2	-
4. Implement Various Clipping algorithms and given curve generating algorithms.	2	2	2	2	-	1	1	3	-

13. PERFORMANCE INDICATOR FOR LL

Sr. No	Performance indicator	Allocated Weightage in %
1	Use of correct syntax/tools/ equipment	20
2	Correctness of algorithm/ logic/ Operating Equipment Skillfully	20
3	Debugging ability/observations/methodology	10
4	Coding standards)/safety measures/standard practices	10
5	Quality of input and output	10
6	Answer to sample questions	20
7	On time submission	10
Total		100%

14. PERFORMANCE INDICATOR FOR TL

NA

15. PERFORMANCE INDICATOR FOR SL

S. No.	Performance Indicators	Weightage in % (Group Activity)	Weightage in % (Individual Activity)
a.	Selection of topic and relevance	10	10
b.	Preparing and submission of execution plan	10	10
c.	Relevant Information collection	20	20
d.	Activity execution process	20	20
e.	Submission of self learning activity report	10	20
f.	Contribution of team members	10	-
g.	Evaluation of presentation & question answer	20	20
Total		100%	100%

16. COURSE CURRICULUM DEVELOPMENT COMMITTEE:

SR. NO.	NAME	DESIGNATION	INDUSTRY/INSTITUTE
1	Smt V.M. Aswar	Lecturer in Computer Engineering	Government Polytechnic Amravati
2	Smt. S. P. Rangari	Lecturer in Computer Engineering	Government Polytechnic Amravati

Programme Board of Studies (Computer Engineering), Government Polytechnic, Amravati has approved the above course curriculum on 12/07/2024 and is adopted for Computer Engineering Programme.

CHAIRMAN
PROGRAMME BOARD OF STUDIES,
COMPUTER ENGINEERING
GOVERNMENT POLYTECHNIC,
AMRAVATI.

The Board of Studies has approved the above course curriculum on 15/07/2024.

The Governing Body has approved the above course curriculum on 02/08/2024.