<table>
<tr><td>1.</td><td colspan="5">Name of Course</td><td colspan="2">Computer Graphics</td></tr>
<tr><td>2.</td><td colspan="5">Course Code</td><td colspan="2">CCPS3673</td></tr>
<tr><td>3.</td><td colspan="5">Name(s) of academic staff</td><td colspan="2"></td></tr>
<tr><td>4.</td><td colspan="5">Rationale for the inclusion of the course/module in the programme</td><td colspan="2">major
This module provides the student with knowledge of the various concepts, techniques and algorithms used in computer graphics. The module has great potential in a vocational sense especially for students who are interested in following industrial design, games technology and network related employment.</td></tr>
<tr><td>5.</td><td colspan="5">Semester and Year offered</td><td colspan="2">2 / 3</td></tr>
<tr><td rowspan="3">6.</td><td>Total Student Learning Time (SLT)</td><td colspan="4">Face to Face</td><td>Total Guided and Independent Learning</td></tr>
<tr><td rowspan="2">L = Lecture
T = Tutorial
P = Practical
O= Others</td><td>L</td><td>T</td><td>P</td><td>O</td><td rowspan="2">Independent = 84
Total =140</td></tr>
<tr><td>28</td><td></td><td>28</td><td></td></tr>
<tr><td>7.</td><td colspan="5">Credit Value</td><td colspan="2">3</td></tr>
<tr><td>8.</td><td colspan="5">Prerequisite (if any)</td><td colspan="2">CCPS1543 Computer Programming</td></tr>
<tr><td>9.</td><td colspan="7">Objectives:
The aims of this module are:
• To introduce a range of in computer graphics modelling algorithms and techniques.
• To analyse some of the trade-offs inherent when designing a computer system to support computer graphics.
• To identify current research interests and trends in computer graphics.
• To provide a solid foundation for future development work/research in computer graphics.</td></tr>
<tr><td>10.</td><td colspan="7">Learning outcomes:
Upon the successful completion of this module a student should be able to:
• Explain the mathematical principles on which computer graphics relies and be able to apply appropriate techniques to resolve specific problems in computer graphics.
• Explain the concepts of object modeling, Viewing, Transformation and rendering
• Identify some of the challenges associated with achieving high quality interactive computer graphics and be able to propose and evaluate solutions appropriate to a particular context.
• Select and apply an appropriate range of modelling and animation tools and techniques in the creation of interactive 3D environments using OpenGL.</td></tr>
<tr><td>11.</td><td colspan="7">Transferable Skills:
• Solid foundation for future development work and research in computer graphics.
• develop an awareness of the problems associated with 3D computer graphics
• Be proficient in using OpenGL to develop simple graphic applications
• Communicate effectively about computer graphics</td></tr>
<tr><td>12.</td><td colspan="7">Teaching-learning and assessment strategy
A variety of teaching and learning strategies are used throughout the course, including:
• Classroom lessons. Lectures and Power Point presentations
• Laboratory sessions: Practice exercises
• brainstorming;
• student-Lecturer discussion
• collaborative and co-operative learning;
• Independent study.
Assessment strategies include the following:
• Ongoing quizzes
• Midterm tests
• Performance Assessment (project, Assigned exercises)
• Lecturer Observation</td></tr>
</table>

13. **Synopsis:**

This module provides various concepts, techniques and algorithms used in computer graphics. It includes an introduction to Graphics packages and applications. Review of graphic display architecture and graphic input devices. OpenGL fundamentals, Two- and three-dimensional transformations, matrix formulations, and concatenation. Clipping and windowing. Hidden line and surface elimination.

14. **Mode of Delivery:**

- Classroom lessons. Lectures and Power Point presentations
- Laboratory sessions: Practice exercises

15. **Assessment Methods and Types:**

The assessment for this course will be based on the following:

Coursework **50%**

1. Participation 5%
2. Quizzes and Assignments 10%
3. Project 15%
4. Mid-Semester Exam 20%

Final Examination **50%**

100%

16. **Mapping of the course/module to the Programme Aims**

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12
4	1	3	0	1	1	0	3	0	4	1	0

17. **Mapping of the course/module to the Programme Learning Outcomes**

LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8	LO9	LO10	LO11	LO12
4	3	3	1	1	0	2	2	2	0	1	0

18. **Content outline of the course/module and the SLT per topic**

	Details	SLT			
		L	P	Indep.	Total
Topic 1	**Introduction** Historical Overview of Computer Graphics, Computer Graphics applications, Elements of Pictures created in Computer Graphics. Graphics display devices, Graphics Input Primitives and Devices	2	2	6	**10**
Topic 2	**Elementary Concepts and Applied Geometry** Coordinates, Homogeneous coordinates, 3D Coordinate Spaces, Cartesian space, points & vectors, inner Product, Determinants, Vector Product, The Orientation of Three Points, Polygons, The Area of a Polygon, Point-in-Triangle Test, Point-in-Polygon Test, Point-on-Line Test, Distance Between a Point and a Line, Projection of a Point on a Line. Triangulation of Polygons, Matrix representation, matrix multiplication. Boundaries of Filled Regions.	4	4	12	**20**
Topic 3	**Introduction to OpenGL,**	4	4	12	**20**

	Topic 4	**Graphics Primitives** Points and lines, Line drawing algorithms, Line Equations, DDA Algorithm, Midpoint Algorithm, Bresenham's Line ,Drawing Algorithm, Circles drawing algorithms. Fill-Area Algorithms, Boundary-Fill Algorithm,	4	4	12	**20**
	Topic 5	**2D Viewing** Windowing Concepts; 2D Viewing Pipeline , Windows and Viewports, Window-to-Viewport Transformation, Two-Dimensional Viewing , Aspect Ratio, Cohen–Sutherland Line Clipping, Sutherland–Hodgman Polygon Clipping,	4	4	12	**20**
	Topic 6	**Geometrical Transformations** Linear Transformations. 2D and 3D Translations. 2D and 3D Scaling, 2D and 3D Rotation (About the origin and an Arbitrary Point), Homogeneous Coordinates. Inverse Transformations and Matrix Inversion. Changing the Coordinate System. Rotations About 3D Coordinate Axes. Rotation About an Arbitrary Axis.	4	4	12	**20**
	Topic 7	**3D Modelling and Projection** Polyhedron ,Wireframe Models , Solid Models Blobby Objects , B´ezier Curves, B-Spline Curve Fitting, Sweep Representation, 3D Viewing Pipeline (Orthogonal Projection Oblique Projection ,Perspective Projection , 3D clipping, **Hidden-Face Elimination.** Back-Face Culling, Coloring Individual Faces, Painter's Algorithm, Z-Buffer Algorithm.	4	4	12	**20**
	Topic 8	**Rendering** Light Sources Infinitely Distant Light Sources, Directional Light Sources, Surface Lighting Effects Basic Illumination Models. Texture Mapping	2	2	6	**10**
		Total hours	28	28	84	**140**

	Laboratory	Laboratory Details
		Exercises based on topics covered in each lecture. Laboratory work must include the following:
		• **Introduction to OpenGL comments and library**
		• **Graphics Primitives:** introductory examples (Simple objects drawing e.g. Points and lines, Circles}
		  • 2D objects drawing, Fill-Area
		• **2D Viewing**
		  • Windows and Viewports, Window-to-Viewport Transformation,
		  • Two-Dimensional Viewing , Aspect Ratio, Cohen–Sutherland Line Clipping,
		• **3D Modelling**
		• **2D and 3D Geometrical Transformations**
		• **3D clipping and Hidden-Face Elimination**
		• **Rendering:**
		  • Light Sources Infinitely Distant Light Sources
		  • Directional Light Sources, Surface Lighting Effects Basic Illumination Models.
		  • Texture Mapping
		Animations: introductory examples				

19.	**Main references supporting the course:** • Francis S Hill, Jr. Stephen M Kelley, **Computer Graphics Using OpenGL**: International Ed. , Prentice Hall, 2008.					
	Additional references supporting the course: • Hearn and Baker, **Computer Graphics with OpenGL**, 3rd Ed., Prentice-Hall, 2004 • Leen Ammeraal, **Computer Graphics for Java Programmers**, 2nd Ed. Wiley, 2007					
20.	**Other additional information** All materials will be available to the students online.					