THOMAS ADEWUMI UNIVERSITY, OKO-IRESE	
Faculty	Computing and Applied Sciences
Department	Mathematical and Computing Science
Program	Computer Science
Course Code	CSC 413
Course Title	**COMPUTER GRAPHICS AND VISUALIZATION**
Study Year	4
Credit Hours	3
Contact Hours	42
Pre-requisite	
Status	Compulsory
Semester	First
Mode of Assessment	Lecture, Assessment and Practical
Mode of Delivery	• Classroom Lectures • Laboratory Practical Sessions
Continuous Assessment **Examination** **Total**	 30% 70% 100%
Course Lecturer and Instructor	
Course Description	Computer graphics and visualization is a course that covers the principles, techniques, and tools used to create and manipulate images, videos, and other visual media using computers. The course typically starts with an introduction to the basics of computer graphics, including the concepts of color models, raster graphics, vector graphics, and geometric transformations. The course then progresses to more advanced topics, such as 3D modeling, rendering, animation, and virtual reality. Students will learn about the different algorithms used to generate realistic images, as well as the software and hardware tools used in the graphics pipeline. Visualization is another important aspect of the course, which focuses on the techniques used to represent and visualize complex data sets. The course covers topics such as data visualization, scientific visualization, and information visualization. Students will learn about the tools and techniques used to create interactive and dynamic visualizations, as well as the principles of human-computer interaction and visual perception.
Course Objectives	The objectives of a computer graphics and visualization course typically include the following: 14. To provide students with a solid foundation in the principles, techniques, and tools used in computer graphics and visualization.

	15. To enable students to create and manipulate visual media using software tools and hardware devices. 16. To introduce students to the basics of 2D and 3D graphics, including color models, raster graphics, vector graphics, and geometric transformations. 17. To expose students to advanced topics in computer graphics, such as rendering, animation, and virtual reality. 18. To teach students about the different algorithms used to generate realistic images, as well as the software and hardware tools used in the graphics pipeline. 19. To provide students with an understanding of the principles of human-computer interaction and visual perception, and how they apply to the design of visual media. 20. To teach students about the techniques used to represent and visualize complex data sets, including data visualization, scientific visualization, and information visualization. 21. To provide students with hands-on experience in designing and implementing visual media projects, such as 3D models, animations, and visualizations.
Learning Outcome	At the end of this course, students should be able to: • Students should have a solid understanding of the principles, techniques, and tools used in computer graphics and visualization. • Students should be able to create and manipulate visual media using software tools and hardware devices. • Students should be able to design and implement visual media projects, such as 3D models, animations, and visualizations. • Students should be able to analyze complex data sets and represent them visually using techniques such as data visualization, scientific visualization, and information visualization. • Students should be able to effectively communicate their ideas and findings through visual media, and understand how to use visual media to effectively communicate with others. • Students should be able to apply their knowledge and skills to solve real-world problems, and to identify and evaluate different solutions to those problems. • Students should be able to critically evaluate the effectiveness of visual media, and to analyze the impact of visual media on society and culture.

	• Students should be able to use their creativity to develop innovative solutions and designs for visual media project
Detailed course contents	Hardware aspect, plotters microfilm, plotters display, graphic tablets, light pens, other graphical input aids Facsimile and its problems Refresh display refresh huggers, changing images, light pen interaction. Two and three-dimensional transformation, perspective Clipping algorithms. Hidden line removal bolded surface removal. Warnock method/ algorithm, shading, data reduction for graphical input. Introduction to handwriting and character recognition. Curve synthesis and fitting. Contouring. Ring structures versus doubly-linked lists. Hierarchical structures. Data structure: Organization for interactive graphics.

Course Contents Sequencing

Weeks	**Detailed Course Outline**	**Allocated Time**
WEEK 1, 2	Introduction to Computer Graphics: • Overview of computer graphics and visualization • Basic concepts of graphics systems • Graphics pipeline and transformations • Coordinate systems and projections	6 Hours
WEEK 3,4,5	2D Graphics: • Fundamental concepts of 2D graphics • Geometric primitives and algorithms • 2D transformations and viewing • Raster graphics and algorithms • Anti-aliasing and image processing **C.A Test**	9 Hours
WEEK 6,7,8	3D Graphics: • Fundamental concepts of 3D graphics • Geometric modeling and representation • 3D transformations and viewing • Illumination and shading models • Texture mapping and compositing • Hidden surface removal and clipping	9 Hours
WEEK 9	Graphics APIs: • Overview of graphics APIs such as OpenGL, DirectX, and Vulkan • Graphics programming in a selected API	3 Hours

	• Use of graphics libraries and tools	
WEEK 10	Visualization Techniques: • Visualization of scientific and engineering data • Volume and scalar visualization techniques • Vector and tensor visualization techniques • Information visualization and visual analytics **C.A Test**	3 Hours
WEEK 11	Virtual Reality and Augmented Reality: • Concepts of virtual reality and augmented reality • Graphics techniques for virtual reality • Interaction techniques for virtual reality and augmented reality	3 Hours
WEEK 12	Graphics Applications: • Graphics applications in various domains such as gaming, entertainment, education, medicine, and engineering • Real-time graphics applications • Future directions in computer graphics and visualization.	3 Hours
	REVISION	

READING LIST:

6. Computer Graphics: Principles and Practice by James D. Foley, Andries van Dam, Steven K. Feiner, and John F. Hughes.
7. Interactive Computer Graphics: A Top-Down Approach with WebGL by Edward Angel and Dave Shreiner.
8. Data Visualization: Principles and Practice by Alexandru C. Telea.
9. 3D Computer Graphics: A Mathematical Introduction with OpenGL by Samuel R. Buss.
10. Real-Time Rendering by Tomas Akenine-Moller, Eric Haines, and Naty Hoffman.