Maths and Graphics

Module Information

2022.01, Approved

Summary Information

Module Code	4209COMP
Formal Module Title	Maths and Graphics
Owning School	Computer Science and Mathematics
Career	Undergraduate
Credits	20
Academic level	FHEQ Level 4
Grading Schema	40

Teaching Responsibility

LJMU Schools involved in Delivery
Computer Science and Mathematics

Learning Methods

Learning Method Type	Hours
Lecture	22
Tutorial	11
Workshop	11

Module Offering(s)

Display Name	Location	Start Month	Duration Number Duration Unit
JAN-CTY	CTY	January	12 Weeks

Aims and Outcomes

Aims	To provide mathematical principles in computer graphics.To explain the underpinning concepts within computer graphics.To teach 2D computer graphics operations using a modern graphical API.To develop programming skills in computer graphics.

After completing the module the student should be able to:

Learning Outcomes

Code	Number	Description
MLO1	1	Describe the primary stages of the programmable graphics pipeline in 2D context.
MLO2	2	Apply relevant mathematical principles to solve problems in real-time computer graphics.
MLO3	3	Implement logical expressions and arithmetic models to represent the decisions and actions that form the mechanics an interactive 2D graphical application.
MLO4	4	Construct mathematical models and apply them programmatically to control graphical primitives.
MLO5	5	Use a modern graphics 2D API in conjunction with a high-level programming language to develop an interactive graphical 2D application.

Module Content

Outline Syllabus	Elementary numerical and algebraic processes: fractions, indices, algebraic manipulation.Two-dimensional Cartesian co-ordinates, equation of a straight line and quadratic curve, solution of linear equations containing one and two variables. Elementary trigonometry and trigonometric functions.Multi-dimensional vectors, vector algebra including scalar product.Matrix multiplication for vector transformations.Parametric equations.Set theory and discrete maths.Logic: simple propositional and predicate logic.Introduction to 2D graphics via the programmable pipeline.Applied Mathematics for 2D Computer Graphics: Affine Transformations in 2D.Introduction to the rendering pipeline: Coordinates and Model, World and Screen Spaces.Vector and Raster representation of 2D primitives within the Programmable Pipeline Vertex and graphics primitives in a 2D environment – Buffers and Resources Mapping Sprites via Buffers and Resources – Basic Texture Mapping and Quadrilateral Formation.Quadrilateral-based Text Rendering.Handling Transparency on 2D Texture mapped surfaces.Homogeneous coordinates.Cameras and Orthographic Projections.Applying Orthographic Representation to a 2D graphics application.The Interactive Loop, Timing and Measuring Time.Event Driven Input Handling and Spatial and Temporal Predicates applied to Input. Representations of graphical data and logical state using Object-Oriented Programming techniques.Basic Collision Detection: Broad phase.
Module Overview	This module teaches you the fundamentals of computer graphics, specifically 2D, and its underlying mathematical principles. You will recap a number of elementary mathematics concepts before being introduced to how complex concepts can solve computer graphics problems. The module teaches you the practical aspects of computer graphics through a series of programming workshop using modern graphics API.
Additional Information	This module teaches the fundamental of, and specifically 2D, computer graphics and its underlying mathematical principles. Students will recap on a number of elementary mathematics concepts before being introduced to more complex ones and how to utilise them to solve computer graphics problems. The module teaches the practical aspects of computer graphics through a series of programming workshop using modern graphics API.

Assessments

Assignment Category	Assessment Name	Weight	Exam/Test Length (hours)	Module Learning Outcome Mapping
Technology	Implementation of 2D graphic	50	0	MLO3, MLO4, MLO5
Test	In-class test	50	0	MLO1, MLO2

Module Contacts

Module Leader

Contact Name	Applies to all offerings	Offerings
Sud Sudirman	Yes	N/A

Partner Module Team

Contact Name	Applies to all offerings	Offerings