Liverpool John Moores University

Title:	MATHEMATICS AND 2D COMPUTER GRAPHICS
Status:	Definitive
Code:	**4509YCOM** (119761)
Version Start Date:	01-08-2013
Owning School/Faculty:	Computing and Mathematical Sciences
Teaching School/Faculty:	Kolej Teknologi YPC-ITWEB

Team	Leader
Sud Sudirman	Y

Academic Level:	FHEQ4	**Credit Value:**	24.00	**Total Delivered Hours:**	72.00
Total Learning Hours:	240	**Private Study:**	168		

Delivery Options
Course typically offered: Standard Year Long

Component	Contact Hours
Lecture	24.000
Tutorial	24.000
Workshop	24.000

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Report	AS1	Mathematical principles to computer graphics and computer game application	50.0	
Artefacts	AS2	Implementation of an interactive computer graphics application	50.0	

Aims

-To provide mathematical knowledge essential in computer games development.
-To explain the underpinning concepts within computer graphics.
-To teach computer graphics operations using a modern graphical API.
-To develop programming skills in computer graphics.

Learning Outcomes

After completing the module the student should be able to:

1	Perform basic algebraic manipulations and solve linear, quadratic and simultaneous equations.
2	Apply linear algebra to solve spatial problems.
3	Explain the principles behind 2D computer graphics.
4	Use a modern graphics API to develop an interactive graphical application

Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

Mathematical principles	1	2
Implementation	3	4

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.
-Multidimensional vectors, vector algebra including scalar and cross products, parametric equations of lines, planes and simple curves.
-Homogeneous matrix. Matrix multiplication for vector transformations.
-Simple differentiation techniques.
-Tangents and normals, line, curve and plane intersections.
-Logic algebra: simple propositional and predicate logic.
-Introduction to Computer Graphics: History and definition in computer graphics technologies.
-Overview of modern graphics APIs and application to modern hardware:
-Vertex and graphics primitives (Pipeline Mode).
-Applying Mathematics to Computer Graphics: Transforms and Matrices.
-Introduction to the rendering pipeline: Coordinates and Model, World and Screen Spaces
-Cameras and Graphical Projections: Perspective and Orthographic.
-The four modes of rendering: Forward Rendering Mode and Deferred Rendering Mode.
-Representations of graphical data and using Object-Oriented Programming in Graphics
-Changing the Aesthetics of Geometry.
-Programming interaction and rigid body animations.

Learning Activities

Lectures incorporating demonstrations will be followed by tutor-led practical sessions. These will be supported by practical hands-on work in the laboratory.

References

Course Material	Book
Author	Van Verth, J. M. and Bishop, L. M.
Publishing Year	2008
Title	Essential Mathematics for Games and Interactive Applications
Subtitle	
Edition	2nd Edition
Publisher	CRC Press
ISBN	0123742978

Course Material	Book
Author	Shreiner, D., Sellers, G., Kessenich, J.M. and Licea-Kane B. M.
Publishing Year	2013
Title	OpenGL Programming Guide
Subtitle	The Official Guide to Learning OpenGL, Version 4.3
Edition	8th Edition
Publisher	Addison-Wesley Professional
ISBN	0321773039

Course Material	Book
Author	Shreiner, D. and Edward, A.
Publishing Year	2011
Title	Interactive Computer Graphics
Subtitle	A Top-Down Approach with Shader-Based OpenGL
Edition	6th Edition
Publisher	Pearson Education
ISBN	027375226X

Course Material	Book
Author	Akenine-Moller, T., Haines, E. and Hoffman, N.
Publishing Year	2008
Title	Real-Time Rendering
Subtitle	
Edition	3rd Edition
Publisher	A K Peters/CRC Press
ISBN	1568814240

Course Material	Book
Author	Zink, J., Pettineo, M. and Hoxley, J.
Publishing Year	2011

Title	Practical Rendering & Computation with Direct 3D 11
Subtitle	
Edition	
Publisher	A K Peters/CRC Press
ISBN	1568817207

Notes

This module introduces students to the concept of computer graphics including the required mathematical understanding such as linear algebra, vector geometry and matrix operations. The module will use a modern graphics API to illustrate the graphics concept and at the same time teaches students on how to use the API to develop graphics applications.