

Liverpool John Moores University

Title: ADVANCED MATHEMATICS FOR 3D COMPUTER GAMES
Status: Definitive
Code: **6005MATHS** (103242)
Version Start Date: 01-08-2016
Owning School/Faculty: Applied Mathematics
Teaching School/Faculty: Applied Mathematics

Team	Leader
Paul Strickland	Y

Academic Level: FHEQ6
Credit Value: 12
Total Delivered Hours: 36
Total Learning Hours: 120
Private Study: 84

Delivery Options

Course typically offered: Semester 1

Component	Contact Hours
Lecture	12
Practical	12
Tutorial	12

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Report	AS1	Report	50	
Report	AS2	Report	50	

Aims

This module will enable students to become familiar with mathematical algorithms used in modern games programming, so that they can use and apply them appropriately.

Learning Outcomes

After completing the module the student should be able to:

- 1 Use matrix algebra to perform spatial transformations in 3-D.
- 2 Use vectors to solve ray problems in computer graphics.
- 3 Perform numerical methods such as interpolation.
- 4 Apply mathematical software and/or a programming language to perform all of the above.

Learning Outcomes of Assessments

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

Report 1	1	2	3
Report 2	4		

Outline Syllabus

The syllabus will reflect current practice, so that the following is just a suggested list of topics.

3-D coordinate systems. Plotting functions in 3-D coordinate systems such as cylindrical polar, spherical polar, etc.

Principle of Animation (2D, 3D Animation) and Computer Animation Software.

Storyboarding, scene composition and rendering.

Real-Time vs. single Frame Animation.

Animation Hardware.

Display Pipeline, Matrix Transformation and Interpolation.

Linear algebra: determinant, inverse, transpose, eigenvalues and eigenvectors, positive definite matrix, adjacency matrix representation of networks. Applications to 3-D transformations. Solutions of systems of equations.

Applications of vector geometry to 3-D graphics: ray tracing and ray geometry.

Interpolation: linear interpolation: cubic splines, Bezier curves, B-splines.

Use of mathematical software and algorithms to solve problems in each topic above.

Learning Activities

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

Notes

This module teaches mathematical techniques, assessed by coursework 1, and their application in game development, in coursework 2.