MATH H1215: Applied Maths (Elective2)

Module Title:	Applied Maths (Elective2)
Language of Instruction:	English

Credits:	10

NFQ Level:	6

Module Delivered In	No Programmes

Teaching & Learning Strategies:	A mix of traditional lectures and programming practicals that will enable the student to fully understand the use of mathematical methods in computer graphics and apply these ideas in their own computer code.

Module Aim:	To provide the student with an understanding of the mathematics required to model the real world as applied in computer graphics.

Learning Outcomes	
On successful completion of this module the learner should be able to:	
LO1	carry out vector and matrix operations and apply these operations in computer graphics;
LO2	use matrices to represent and carry out transformations and rotations in 2 and 3D space;
LO3	manipulate complex numbers and quaternions and use them in graphics transformations;
LO4	apply the mathematical methods required for 3D geometry and colour manipulation in computer graphics;
LO5	represent mathematical structures in computer code;
LO6	use computer programmes to further explore the concepts of this syllabus.

Pre-requisite learning
Module Recommendations *This is prior learning (or a practical skill) that is recommended before enrolment in this module.*
No recommendations listed
Incompatible Modules *These are modules which have learning outcomes that are too similar to the learning outcomes of this module.*
No incompatible modules listed
Co-requisite Modules
No Co-requisite modules listed
Requirements *This is prior learning (or a practical skill) that is mandatory before enrolment in this module is allowed.*
No requirements listed

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Module Content & Assessment

Indicative Content
Trigonometry: angles, trigonometric functions and Pythagoras's theorem.
Vectors vector properties, operations on vectors, dot products, cross products, dimensions, normalisation, geometric interpretations
Matrices matrix properties, linear systems, matrix inverses, determinants, eigenvalues and eigenvectors, diagonalization, tensors.
Complex Numbers the argand diagram, operations on complex numbers, conjugates, Euler's identity, 2D rotations with complex numbers, extention to quaternions, 3D rotations with quaternions.
Transforms coordinate systems, simple translations, scaling transforms, rotational transforms, general linear transforms, homogeneous coordinates, Euler angle representation compared to quaternions and converting between the two.
3D Engine Geometry lines in 3D space, planes in 3D space, intersections of lines with planes, the view frustum, parallel and perspective projections.
Ray Tracing root finding, ray and surface intersections, normal vector calculation, reflection and refraction of rays
Illumination RGB colour, light sources, diffuse lighting, specular lighting, texture mapping.

Assessment Breakdown	%
Continuous Assessment	20.00%
Practical	30.00%
End of Module Formal Examination	50.00%

Continuous Assessment

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Other	CA marks will be based on the results of four or five 45 minute written tests held during the term.	1,2,3,4,5,6	20.00	n/a

No Project

Practical

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Practical/Skills Evaluation	Practical marks will be allocated for participation in and the completion of the practical exercises.	5,6	30.00	n/a

End of Module Formal Examination

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Formal Exam	The terminal examination will include questions on all aspects of the course.	1,2,3,4,5,6	50.00	End-of-Semester

SETU Carlow Campus reserves the right to alter the nature and timings of assessment

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Module Workload

Workload: Full Time		
Workload Type	*Frequency*	*Average Weekly Learner Workload*
Lecture	30 Weeks per Stage	3.00
Laboratory	30 Weeks per Stage	1.00
Estimated Learner Hours	30 Weeks per Stage	1.00
	Total Hours	150.00