Institute of Technology Tallaght
Institiúid Teicneolaíochta Tamhlacht

MATH H3071: Technical Mathematics 6 Extra Header Data

Module Delivered in

Programme Code	Programme	Semester	Delivery
TA_EAEEE_D	Bachelor of Engineering in Energy and Environmental Engineering	6	Mandatory
TA_EAEEE_B	Bachelor of Science (Honours) in Energy Systems Engineering	6	Mandatory

Short Title:	Technical Mathematics 6 APPROVED
Full Title:	Technical Mathematics 6

Module Code:	MATH H3071	**NFQ Level:**	7	**ECTS Credits:**	5

Reviewed By:	JAMES WRIGHT

Description:	This module aims to: To support Semester 6 modules by introducing Laplace Transforms and their use in solving linear differential equations. 2. To deepen the students knowledge of geometry, by introducing the formulation and solution of 3D problems involving lines and planes in vector notation. To be able to calculate the divergence, gradient and curl and relate these to ideas in geometry and physics. 3. To use iterative techniques to solve equations numerically and as an introduction to material they may cover in year 4.

Learning Outcomes:

On successful completion of this module the learner will be able to

1. To find and invert Laplace transforms directly and indirectly from Tables
2. To use Laplace Transforms in the solution of linear first and second order differential equations with constant coefficients
3. To write the coordinates of points in i, j, k notation from a diagram
4. To find the equations of lines, line segments and planes and solve problems involving these
5. To find the divergence, gradient and curl for polynomially defined functions
6. To use the gradient to find the directional derivative, maximum rate of change, tangent planes and normal lines
7. Use Newton's Method and the Bisection Method in one variable to numerically solve an equation
8. To use the first order Euler method to numerically solve a first order differential equation

MATH H3071: Technical Mathematics 6 Extra Header Data

Module Content & Assessment

Content
The Laplace Transform: Definition. The Laplace transform of common functions. Linearity rules. Transform of derivatives. Application: Solution of first and second order linear ODE's with constant coefficients. **Vector Calculus** i, j, k notation. Equations of lines and planes in 3D. Intersection point of line with a plane. Gradient, divergence, curl. Directional derivatives and maximum rate of change. Tangent planes and normal lines to a surface. **Numerical Methods** Newton-Raphson and Bisection methods. First order Euler method for a first order differential equation

Assessment Breakdown	%
Course Work	30%
End of Semester Formal Examination	70%

	Outcome addressed	*% of total*	*Assessment Date*
Formal End-of-Semester Examination	1,2,3,4,5,6,7,8	70%	Semester End

Coursework Breakdown				
Type	*Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Continuous Assessment	CA Test covering the Laplace Transform and 3D lines and planes	1,2,3,4	15	Week 7
Continuous Assessment	CA to use a spreadsheet to implement bisection, Newton or Euler methods and high threshold Keyskills test	3,4,5,6,7,8	15	Week 12

Reassessment Requirement
Repeat examination *Reassessment of this module will consist of a repeat examination. It is possible that there will also be a requirement to be reassessed in a coursework element.*

IT Tallaght reserves the right to alter the nature and timings of assessment

MATH H3071: Technical Mathematics 6 Extra Header Data

Module Workload & Resources

Workload	**Full-time**			
Type	*Description*	*Hours*	*Frequency*	*Average Weekly Learner Workload*
Lecture	Classwork	3	Every Week	3.00
Lecturer/Lab	Computing practical	1	Every Week	1.00
Independent Learning Time	Outside of Class	3	Every Week	3.00
			Total Weekly Learner Workload	7.00
			Total Weekly Contact Hours	4.00

Resources
Required Book Resources
K. A. Stroud, with additions by Dexter J. Booth 2007, *Engineering mathematics*, 4th ed Ed., Industrial Press New York [ISBN: 9780831133276]
Recommended Book Resources
K.A. Stroud, Dexter J. Booth, 2003, *Advanced Engineering Mathematics*, 4th ed Ed., Palgrave macmillian UK [ISBN: 9781403903129]