

Subject Description Form

Subject Code	AMA3724
Subject Title	Further Mathematical Methods
Credit Value	3
Level	3
Pre-requisite	▪ Intermediate Calculus and Linear Algebra (AMA2007/AMA2707) or ▪ Mathematics I (AMA2111) or ▪ Mathematics for Engineers (AMA2131/AMA2308) or ▪ Applied Mathematics II (AMA2512) or ▪ Mathematics for Scientists and Engineers (AMA2882) or ▪ Engineering Mathematics (AMA290) or ▪ Both Calculus and Linear Algebra I (AMA1007) and Mathematical Methods for Finance (AMA2703) or ▪ Both Basic Mathematics II - Calculus and Linear Algebra (AMA1120) and Engineering Mathematics (AMA2380) ▪ Both Linear Algebra (AMA1751) and Multivariable Calculus (AMA2702)
Exclusion	Advanced Calculus and Linear Algebra (AMA2701/AMA2701A) Advanced Mathematical Methods for Economics and Finance (AMA273) Further Mathematical Methods for Finance (AMA3723)
Objectives	This subject is to introduce students to the ideas and techniques of linear algebra, differential equations and their applications.
Intended Learning Outcomes	Upon satisfactory completion of the subject, students should be able to: a. perform basic operations of matrix algebra and apply them to solve system of linear equations; b. discuss the basic concepts of matrix algebra and differential equations; c. apply the techniques of linear algebra to solve problems in applied mathematics and finance analytics; d. use differential equations to model basic problems in economics and finance, and know how to solve certain classes of first and second order linear ordinary and partial differential equations.
Subject Synopsis/ Indicative Syllabus	<i>Matrix algebra (7 hours)</i> Matrix addition and multiplication, determinant and inverse of square matrices, system of linear equations as a matrix equation, linear dependence and independence. <i>Eigenvalue problems (6 hours)</i> Eigenvalues and eigenvectors, diagonalization of matrices (with distinct eigenvalues), applications.

	<i>Inner products (7 hours)</i> Inner product, norm, orthogonality, Gram-Schmidt orthogonalization process, least square problems <i>Ordinary Differential equations (9 hours)</i> First-order equations; second-order equations; applications <i>Partial Differential Equations: (10 hours)</i> Classification of PDE; separation of variables; solution of initial and boundary value problems for standard PDE; series of solutions (Fourier series); transforming the Black-Scholes Equation into the Heat Equation																																						
Teaching/Learning Methodology	The subject will be delivered mainly through lectures and tutorials. The lectures will be conducted to provide the students with an integrated knowledge required for the understanding of the basic mathematical concepts and techniques. To develop students' ability for logical thinking, effective communication and ability to apply the theory they learn in lectures, tutorial and presentation sessions will be held.																																						
Assessment Methods in Alignment with Intended Learning Outcomes	<table border="1"> <thead> <tr> <th rowspan="2">Specific assessment methods/tasks</th><th rowspan="2">% weighting</th><th colspan="4">Intended subject learning outcomes to be assessed (Please tick as appropriate)</th></tr> <tr> <th>a</th><th>b</th><th>c</th><th>d</th></tr> </thead> <tbody> <tr> <td>1. Assignments / Quizzes</td><td>15%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr> <tr> <td>2. Tests</td><td>25%</td><td>✓</td><td>✓</td><td></td><td></td></tr> <tr> <td>3. Examination</td><td>60%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr> <tr> <td>Total</td><td>100 %</td><td colspan="4"></td></tr> </tbody> </table> Continuous Assessment comprises of assignments and/or quizzes, and tests. A written examination is held at the end of the semester.					Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)				a	b	c	d	1. Assignments / Quizzes	15%	✓	✓	✓	✓	2. Tests	25%	✓	✓			3. Examination	60%	✓	✓	✓	✓	Total	100 %				
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Student Study Effort Expected	Class contact:																																						
	• Lecture				26 Hrs.																																		
	• Tutorial				13 Hrs.																																		
	Other student study effort:																																						
	• Self-Study				33 Hrs.																																		
	• Assignments				33 Hrs.																																		
	Total student study effort				105 Hrs.																																		
Reading List and	<u>Textbooks:</u>																																						

References	Anton, H.	Elementary Linear Algebra, 11 th edition	John Wiley & Sons, 2014
	Logan, J. David	A First Course in Differential Equations	Springer, 2015.
	Walter A. Strauss	Partial Differential Equations, An Introduction, 2 nd edition	John Wiley & Sons, Inc., 2008
	<u>References:</u>		
	Kolman, B. & Hill, D.R.	Elementary Linear Algebra with Applications 9 th edition	Prentice Hall 2007
	Lay, D.C., Lay, S.R. & McDonald, J.	Linear Algebra with its Applications, 5 th edition	Pearson, 2016
	Boyce, W.E. & DiPrima, R.C.	Elementary Differential Equations, 10 th edition	Wiley, 2012
	Bleecker, D. & Csordas, G.	Basic Partial Differential Equations	International Press, 1996