Subject Description Form

Subject Code	AMA3001
Subject Title	Mathematical Methods for Data Science
Credit Value	3
Level	3
Pre-requisite	Calculus and Linear Algebra (AMA1008) or equivalent
Objectives	This subject aims to introduce students to the basic concepts and applications of elementary calculus and matrices. Emphasis will be on the understanding of fundamental concepts and the use of mathematical techniques in handling practical problems in science and engineering.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a) apply the differentiability of multivariable functions to compute derivatives using various rules of differentiation; apply differential calculus to calculate rates of change, locate local extrema; b) develop the concept of multiple integral of a function of several variables over a plane or space domain and evaluate multiple integrals; c) perform basic operations of matrix algebra and apply them to study system of linear equations; d) discuss the basic concepts of vector space, linear transformations and inner product; e) apply the techniques of linear algebra to problems in applied mathematics
Subject Synopsis/ Indicative Syllabus	**Calculus:** *Differential Calculus for functions of several variables:* Partial derivatives; chain rule; Taylor's Formula; relative extrema; Lagrange multipliers; linear and nonlinear constrained optimization. *Multiple Integrals:* Double and triple integrals; the change of variables formula. **Linear algebra:** Basic properties of matrices, linear systems, linear dependence; inner product, norm; orthogonality; Gram-Schmidt orthogonalization process; diagonalization of symmetric matrices; eigenvalues and eigenvectors. **Applications:** Use mathematical methods to analyze data examples from real world.
Teaching/Learning Methodology	Basic concepts and elementary techniques of differential and integral calculus and linear algebra will be taught in lectures. These will be further enhanced in tutorials through practical problem solving.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)				
		a	b	c	d	e
1. Tests/Assignments	40%	✓	✓	✓	✓	✓
2. Examination	60%	✓	✓	✓	✓	✓
Total	100 %					

Continuous Assessment comprises of individual assignments, in-class quizzes, and a mid-term test (40%). An examination (60%) is held at the end of the semester. Questions used in assignments, quizzes, tests and examinations are used to assess students' level of understanding of the basic concepts and their ability to use mathematical techniques in solving problems in science and engineering.

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:
The subject focuses on knowledge, skill and understanding of concepts and application of techniques in **Intermediate/Advanced Calculus and Linear algebra**. As such, an assessment method based mainly on examinations/tests/quizzes is considered appropriate. Furthermore, students are required to submit individual homework assignments regularly in order to allow subject lecturers to keep track of students' progress in the course.

Student Study Effort Expected

Class contact:	
• Lecture	26 Hrs.
• Tutorial	13 Hrs.
Other student study effort:	
• Self-study	78 Hrs.
Total student study effort:	117 Hrs.

Reading List and References

Reference

Chung, K.C.	A Short Course in Calculus and Matrices	McGraw Hill 2013
Hung, K.F., Kwan, Wilson, Pong, T.Y.	Foundation Mathematics & Statistics	McGraw Hill 2013
Anton, H.	Elementary Linear Algebra 10th edition	John Wiley & Sons 2010
Larson, R	Elementary Linear Algebra	Brooks/Cole 2013
Chan, C.K, Chan, C.W., Hung, K.F.	Basic Engineering Mathematics	McGraw Hill 2011