Subject Description Form

Subject Code	AMA3708
Subject Title	Differential Equations
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 ▪ Engineering Mathematics (AMA2380) or ▪ Applied Mathematics II (AMA2512) or ▪ Multivariable Calculus (AMA2702) or ▪ Mathematics for Scientists and Engineers (AMA2882) or ▪ Engineering Mathematics (AMA290)
Exclusion	Mathematics II (AMA2112)
Objectives	The objective of this subject is to provide students with a comprehensive understanding of the ideas and techniques used in the topic of differential equations. Students will be able to apply their knowledge to real-world problems in disciplines such as physics, engineering, finance, and economics.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: (a) Gain a fundamental understanding and knowledge of ordinary and partial differential equations, including their types, order and degree. (b) Apply various methods for solving ordinary and partial differential equations. (c) Analyze and interpret solutions to differential equations, including investigating their properties, stability, and the behavior of solutions over time. (d) Apply techniques for solving differential equations to real-world problems in fields such as physics, engineering, finance, and economics, and identify the most suitable method to solve the problem.
Subject Synopsis/ Indicative Syllabus	<u>Ordinary differential equations</u> Modeling using ordinary differential equations; First and second order linear differential equations; System of linear differential equations; Laplace transform and convolution theorem. Applications to real-world problems. <u>Partial differential equations</u> Definition and classification of PDEs; Introduction of several classical PDEs (heat, wave and Laplace equations); Initial and boundary value problem of PDEs; Methods of separation of variables; Green functions and fundamental solutions; Fourier transform. Applications to real-world problems.
Teaching/Learning Methodology	This course will use lectures, tutorials, and learning activities to teach students about differential equations. Lectures will introduce the concepts, while tutorials will provide support. Learning activities will reinforce the concepts and encourage critical thinking. Students will engage in self-directed learning, and assessment will be through homework, quizzes, and exams. This methodology balances theory and application, encourages participation.

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)			
		a	b	c	d
1. Assignments/Quizzes	20%	✓	✓	✓	✓
2. Midterm Test	20%	✓	✓	✓	
3. Examination	60%	✓	✓	✓	
Total	100%				

Assessment Methods in Alignment with Intended Learning Outcomes

The subject focuses on knowledge, skill and understanding of Differential Equations, thus, Exam-based assessment is the most appropriate assessment method, including 20% test and 60% examination. Moreover, 20% worth of assignments/in-class quizzes are included as a component of continuous assessment so as to keep the students in progress.

Continuous Assessment comprises of assignments/quizzes and/or tests. A written examination is held at the end of the semester.

Student Study Effort Required

Class contact:	
▪ Lecture	26 Hrs.
▪ Tutorial	13 Hrs.
Other student study effort:	
▪ Assignments/Quizzes	35 Hrs.
▪ Self-study	35 Hrs.
Total student study effort	109 Hrs.

Reading List and References

References:

Chan, C.K., Chan, C.W. & Hung, K.F.	Basic Engineering Mathematics.	McGraw Hill 2013
Kreyszig, E.	Advanced Engineering Mathematics 10th edition	Wiley 2011
James, G.	Advanced Modern Engineering Mathematics 3rd edition	Prentice Hall 2008
Walter A. Strauss	Partial Differential Equations. An introduction. Second edition	Wiley 2007
Grant B. Gustafson	Differential Equations and Linear Algebra: Undergraduate Mathematics, Science and Engineering, First edition (2022)	2022

	Gilbert Strang	Differential Equations and Linear Algebra	Wellesley-Cambridge Press
	Kenneth B. Howell	Ordinary Differential Equations: An Introduction to the Fundamentals, 2nd edition	CRC Press, 2019