

Subject Description Form

Subject Code	AMA507
Subject Title	Mathematical Modelling for Science and Technology
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	The objectives of this subject are to teach students how real-life problems can be built upon a suitable mathematical model and solved by mathematical methods. Some formulations and solutions of mathematical models in science and engineering will be investigated.
Intended Learning Outcomes	<p>Upon completion of the subject, students will be able to:</p> <ul style="list-style-type: none"> (a) Systematically formulate mathematical models by a variety of modelling methodologies and mathematical concepts. (b) Compare, analyze, interpret and validate different mathematical models. (c) Apply computer algebraic system for generating solutions of mathematical models. (d) Apply model building techniques and their solutions for real world problems and for decision making. (e) Present in both written and oral academic communication for ideas, problem solutions and information involving mathematical contents.
Subject Synopsis/ Indicative Syllabus	<p>Introduction to mathematical modelling: mathematical modelling process; problem formulation; mathematical description and analysis, mathematical model, model interpretation and validation.</p> <p>Methodology: system characterization, system and environment, continuous and discrete variables, discrete-time and continuous-time mathematical models and modelling, models for deterministic static systems, models for deterministic dynamic systems, models for probabilistic static systems, stochastic dynamic systems and chaotic dynamics.</p> <p>Use of software packages for model evaluation.</p>
Teaching/Learning Methodology	The subject will be delivered mainly through lectures and tutorials. The teaching and learning approach is mainly problem-solving oriented. The approach aims at the development of mathematical techniques and how the techniques can be applied to solving problems. Students are encouraged to adopt a deep study approach by employing high level cognitive strategies, such as critical and evaluative thinking, relating, integrating and applying theories to practice.

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. Mini-project/ Presentation	65%	✓	✓	✓	✓	✓
2. Assignment/ Test	35%	✓	✓	✓	✓	✓	
Total	100 %						
Continuous Assessment comprises of mini-project with presentation, assignments and a mid-term test.							
Student Study Effort Required	Class contact:						
	▪ Lecture		26 Hrs.				
	▪ Class discussion, Supervised case study and student presentation		13 Hrs.				
	Other student study effort:						
	▪ Group activity		58 Hrs.				
	▪ Self-study		40 Hrs.				
	Total student study effort		137 Hrs.				
Reading List and References	Meyer, W.J.	Concepts of Mathematical Modeling	McGraw-Hill, 2004				
	Frank R. Giordano, William P. Fox, Steven B. Horton, and Maurice D. Weir	A First Course in Mathematical Modeling	Brooks Cole, 2009				
	Mark M. Meerschaert	Mathematical Modeling, 4th Edition	Academic Press, 2013				
	Stefan Heinz	Mathematical Modeling	Springer, 2011 Edition				