

# The Hong Kong Polytechnic University

## Subject Description Form

<b>Subject Code</b>	AMA4450
<b>Subject Title</b>	Mathematical Modelling
<b>Credit Value</b>	3
<b>Level</b>	4
<b>Pre-requisite</b>	AMA3410 Differential Equations, or AMA3724 Further Mathematical Methods
<b>Objectives</b>	This course introduces the process of mathematical modelling and some basic mathematical tools for the quantitative description of practical problems arising from different fields.
<b>Intended Learning Outcomes</b>	Upon completion of the subject, students will be able to: (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 programming for generating solutions of mathematical models; (d) apply model building techniques and their solutions for real world problems and for decision making.
<b>Subject Synopsis/ Indicative Syllabus</b>	Modelling Change with Difference Equations, Modelling Process, Modelling Using Proportionality, Modelling Using Geometric Similarity, Model Fitting, Least-Squares Criterion.  Probabilistic Modelling with Discrete Systems, Markov Chain, Linear Regression, Linear Programming, Simplex Method, Sensitivity Analysis, Numerical Search Methods.  Modelling with a Differential Equation, Population Growth, Numerical Approximation Methods, Modelling with Systems of Differential Equations, Euler's Method.
<b>Teaching/Learning Methodology</b>	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.

<b>Assessment Methods in Alignment with Intended Learning Outcomes</b>	Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)			
			a	b	c	d
	1. Homework	20%	✓	✓	✓	
	2. Test and/or quizzes	30%	✓	✓		
	3. Project	50%	✓	✓	✓	✓
	Total	100%				
	<p>Homework assignments are an effective way to assess students' ability to ILO a,b,c. These tasks often require students to work independently, allowing them to demonstrate their understanding and application of the concepts learned in class.</p> <p>Tests are a traditional and effective method to assess students' understanding of ILO a,b. Tests can be designed to challenge students' understanding and application of the material in a controlled environment.</p> <p>Projects are an excellent way to assess all ILOs. Projects allow students to showcase their ability to integrate and apply their knowledge in a coherent and practical manner. This method also encourages the development of communication skills.</p>					
<b>Student Study Effort Expected</b>	Class contact:					
	▪ Lecture					26 Hrs.
	▪ Tutorial					13 Hrs.
	Other student study effort:					
	▪ Self study					91 Hrs.
	Total student study effort					130 Hrs.
<b>Reading List and References</b>	<p>Giordano, F., Fox, W., and Horton, S. (2014). <i>A First Course in Mathematical Modeling</i>. Cengage Learning.</p> <p>Bender, E. (1978). <i>An introduction to mathematical modelling</i>. Wiley.</p> <p>Heinz, S. (2011). <i>Mathematical Modeling</i>. Springer.</p>					