Subject Description Form

Subject Code	AMA3658
Subject Title	Stochastic Processes for Investment
Credit Value	3
Level	3
Pre-requisite	Calculus and Linear Algebra (AMA1007) or Basic Mathematics II – Calculus and Linear Algebra (AMA1120) or Calculus for Engineers (AMA1130) or Calculus (AMA1131) or Foundation Mathematics for Accounting and Finance (AMA1500) or Calculus (AMA1702) **and** Introduction to Statistics for Business (AMA1501) or Introduction to Statistics (AMA1502/AMA1602) or Probability and Engineering Statistics (AMA2104) or Probability and Distributions (AMA2691) or Mathematical Methods for Finance (AMA2703)
Exclusion	Applied Probability Models for Investment (AMA358)
Objectives	This subject is for students to understand basic probability theory and some advanced probability models which enable them to apply in investment and actuarial science.
Intended Learning Outcomes	Upon satisfactory completion of the subject, students should be able to: a. understand the concepts of random variable and probability distributions; b. understand the fundamental concepts and perform basic operations of discrete and continuous Markov chains; c. construct probability models in situations with uncertainty; d. get familiar with distributions that are useful in investment science; e. evaluate critically the statistical and physical properties of the Brownian motion and apply to pricing stock options problems; f. communicate effectively in a well-structured manner and build up an open-minded attitude g. understand the ethical and social responsibility of an investment or insurance professional
Subject Synopsis/ Indicative Syllabus	Review on probability theory (2 hours) Random variables, probability distributions, conditional probability. Markov chains (9 hours) Discrete time Markov chains, Chapman-Kolmogorov equations, classification of states, limiting probabilities, random walk, branching process, applications.

	Poisson process (12 hours) Counting process, Poisson process, inter-arrival and waiting time distributions, non-homogeneous Poisson process, applications. Continuous-time Markov chains (8 hours) Continuous time Markov chains, birth and death processes, transition probability function, limiting probabilities, applications. Brownian motion (8 hours) Introduction to Brownian motion, hitting times, maximum value, Brownian motion with drift, geometric Brownian motion, pricing stock options, applications.
Teaching/Learning Methodology	The subject will be delivered mainly through lectures and tutorials. The lectures will be conducted to introduce concepts of probability theory and probability models in the syllabus, which are then reinforced by learning activities involving demonstration, tutorial exercise and assignments.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)						
		a	b	c	d	e	f	g
1. Assignments	15%	✓	✓	✓	✓			
2. Tests	25%	✓	✓	✓	✓		✓	
3. Examination	60%	✓	✓	✓	✓	✓	✓	✓
Total	100 %							

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

The subject focuses on knowledge, skill and understanding of **Probability for Investment and Risk Management**, thus, **Exam-based assessment** is the most appropriate assessment method, including 25% test and 60% examination. Moreover, 15% worth of assignments are included as a component of continuous assessment so as to keep the students in progress.

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

Student Study Effort Expected

Class contact:	
▪ Lecture	26 Hrs.
▪ Tutorial	13 Hrs.
Other student study effort:	
▪ Assignment	20 Hrs.
▪ Self-study	58 Hrs.

	Total student study effort	117 Hrs.
Reading List and References	<u>Textbook</u>:	
	Ross, S.M. Introduction to Probability Models 11th edition	Academic Press 2014
	<u>References</u>:	
	Jones, P.W. & Smith, P. Stochastic processes: an introduction 3rd edition	CRC Press 2018