Subject Description Form

Subject Code	AMA359
Subject Title	Mathematics of Financial Derivatives
Credit Value	3
Level	2
Pre-requisite / Co-requisite/ Exclusion	Pre-requisites: Further Calculus (AMA251) and Theory of Interest (AMA253)
Objectives	This subject aims to introduce the basic concepts and techniques of financial analysis in derivatives markets. Special emphasis is on the applications of mathematics and statistics to financial decision making.
Intended Learning Outcomes	Upon satisfactory completion of the subject, students should be able to: 1. apply mathematical and statistical knowledge to financial derivatives; 2. apply no-arbitrage principle to investigate real-life market derivatives; 3. apply option theory to handle the pricing of financial derivatives; 4. apply and evaluate the mathematical tools to analyze practical examples in finance and decision in investment.
Subject Synopsis/ Indicative Syllabus	*Introduction to Derivatives* Uses of and perspectives on derivatives, role of financial markets, derivatives in practice *Forwards, Options, Insurance, Collars and Other Strategies* Forward contracts, call and put options, basic insurance strategies, put-call parity, speculating on volatility, futures contracts, currency contracts, Eurodollar contracts *Parity and Option Relationships* Generalized parity and exchange options, comparing options *Binomial Option Pricing* Binomial tree, risk-neutral valuation, lognormality and estimating volatility *Black-Scholes Formula* Introduction to the Black-Scholes formula and its applications, option Greeks, implied volatility, perpetual American options *Market-Making and Delta-Hedging* Market-maker risk, Delta-hedging and its mathematics, Black-Scholes analysis *Exotic Options* Asian options, barrier options, compound options, gap options and exchange options *Advanced pricing Theory* Lognormal distribution and model of stock prices, Brownian motion and geometric Brownian motion, Itô's lemma, interest rate models

<table>
<tr><td>Teaching/Learning Methodology</td><td>This subject will be delivered through lectures and tutorials. The lectures will introduce mathematical concepts of financial analysis and its usages in derivatives markets. Learning activities will be reinforced through demonstration in class, tutorial exercises, assignments, test and examination.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% weighting</td><td colspan="4">Intended subject learning outcomes to be assessed (Please tick as appropriate)</td></tr>
<tr><td>1</td><td>2</td><td>3</td><td>4</td></tr>
<tr><td>a. Assignments</td><td>20%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>b. Tests</td><td>20%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>c. Examination</td><td>60%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Total</td><td>100 %</td><td colspan="4"></td></tr>
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The learning outcomes will be assessed by a combination of assignments, mid-term tests and the final examination.

To pass this subject, students are required to obtain Grade D or above in <u>both</u> the Continuous Assessment and the Examination components.
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<tr><td>Student Study Effort Required</td><td>
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<tr><td>Class contact:</td><td></td></tr>
<tr><td>▪ Lecture</td><td>28 Hrs.</td></tr>
<tr><td>▪ Tutorial</td><td>14 Hrs.</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>▪ Assignment</td><td>30 Hrs.</td></tr>
<tr><td>▪ Self-study</td><td>40 Hrs.</td></tr>
<tr><td>Total student study effort</td><td>112 Hrs.</td></tr>
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<tr><td>Reading List and References</td><td>
<table>
<tr><td>McDonald, R.L.</td><td>Derivatives Markets</td><td>Pearson, 2006</td></tr>
<tr><td>Hull, J.C.</td><td>Options, Futures, and Other Derivatives, 6th edition</td><td>Pearson, 2006</td></tr>
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