Subject Description Form

Subject Code	COMP4146
Subject Title	Computational Finance
Credit Value	3
Level	4
Pre-requisite / Co-requisite / Exclusion	Nil
Objectives	The objectives of this subject are to: • introduce the knowledge of financial models, quantitative methods and computational analysis techniques; and • demonstrate the methodologies for financial simulation and evaluation.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: *Professional/academic knowledge and skills* (a) understand the fundamental concepts of financial engineering; (b) be aware of the computational tools for finance; (c) make reasonable judgment in choosing suitable computation model to solve problems in finance; and (d) perform financial simulation and analysis. *Attributes for all-roundedness* (e) develop skills in problem solving using systematic approaches; and (f) solve complex problems in groups and develop group work.
Subject Synopsis/ Indicative Syllabus	**Topic** **1. Introduction to Finance** Money, distribution of money, present value analysis, fundamental analysis, WACC. **2. Computational Techniques for Financial Problems** Prediction/forecasting; classification; technical analysis; discounted cash flow analysis valuation. **3. Portfolio Theory and Optimization** Portfolio return and risk, 2 and N assets portfolio analysis, portfolio optimization, Sharpe ratio, expected utility.

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<tr><td></td><td>
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<tr><td>4. Introduction to Financial Options

Derivative; foreign exchange; random walks and Markov processes; Ito’s lemma; Black-Sholes equations; hedging.</td></tr>
<tr><td>5. Computational Tools for Financial Options

European/American Option valuation; Binomial trees; CRR parameter matching; Greek Letters; Monte Carlo simulation.</td></tr>
<tr><td>6. Case Study

Customer credit risk analysis; foreign exchange forecast, etc.</td></tr>
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Case Study: may involve lecture/tutorial/paper-reading/discussion on topics stipulated by the subject lecturer.</td></tr>
<tr><td>Teaching/ Learning Methodology</td><td>Teaching is based on lectures in which ethical issues of finance are presented. Lectures include solving technical problems in computational finance. Tutorials are used to provide examples of problems and to show how solutions are developed. There is a project that students need to write their report. The project is typically done by a group of students.</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="6">Intended subject learning outcomes to be assessed (Please tick as appropriate)</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td><td>f</td></tr>
<tr><td>1. Project</td><td rowspan="3">55%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>2. Mid-term/Quizzes</td><td>✓</td><td></td><td>✓</td><td>✓</td><td></td><td></td></tr>
<tr><td>3. Examination</td><td>45%</td><td>✓</td><td></td><td>✓</td><td>✓</td><td></td><td></td></tr>
<tr><td>Total</td><td>100%</td><td colspan="6"></td></tr>
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Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

The project is suitable to assess all the intended learning outcomes as it involves all of them. The mid-term/quizzes and examination will test the fundamental concepts learnt by the students as well as to see if the students are capable to perform financial simulation and analysis.</td></tr>
<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td colspan="2">Class contact:</td></tr>
<tr><td>▪ Lectures</td><td>33 Hrs.</td></tr>
<tr><td>▪ Tutorials</td><td>6 Hrs.</td></tr>
<tr><td colspan="2">Other student study effort:</td></tr>
<tr><td>▪ Project</td><td>27 Hrs.</td></tr>
<tr><td>▪ Self-Study</td><td>39 Hrs.</td></tr>
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	Total student study effort	105 Hrs.
Reading List and References	**Reference Books:** 1. Kosowski, Robert L. and Neftci, Salih N., *Principles of Financial Engineering*, 3rd Edition, Academic Press, 2015. 2. Seydel, Rudiger, *Tools for Computational Finance*, 6th Edition, Springer-Verlag, 2017. 3. Ugur, Omur, *An Introduction to Computational Finance*, Imperial College Press, London, 2009. 4. Levy, George, *Computational Finance: Numerical Methods for Pricing Financial Instruments*, Elsevier, 2004. 5. Levy, Moshe, Levy, Haim and Solomon, Sorin, *Microscopic Simulation of Financial Markets*, Academic Press, 2003. 6. Hull, Hohn C., *Options, Futures, and Other Derivatives*, 9th Edition, Prentice Hall, 2015. 7. McKinney, Wes, *Python for Data Analysis*, 2nd Edition, O'Reilly, 2017.	