

Subject Description Form

Subject Code	COMP4146				
Subject Title	Computational Finance				
Credit Value	3				
Level	4				
Pre-requisite / Co-requisite / Exclusion					
Objectives	<p>The objectives of this subject are to:</p> <ul style="list-style-type: none"> • introduce the knowledge of financial models, quantitative methods and computational analysis techniques; and • demonstrate the methodologies for financial simulation and evaluation. 				
Intended Learning Outcomes	<p>Upon completion of the subject, students will be able to:</p> <p><i>Professional/academic knowledge and skills</i></p> <p>(a) understand the fundamental concepts of financial engineering;</p> <p>(b) be aware of the computational tools for finance;</p> <p>(c) make reasonable judgment in choosing suitable computation model to solve problems in finance; and</p> <p>(d) perform financial simulation and analysis.</p> <p><i>Attributes for all-roundedness</i></p> <p>(e) develop skills in problem solving using systematic approaches; and</p> <p>(f) solve complex problems in groups and develop group work.</p>				
Subject Synopsis/ Indicative Syllabus	<table border="1" style="width: 100%;"> <thead> <tr> <th style="text-align: left;">Topic</th> </tr> </thead> <tbody> <tr> <td> <p>1. Introduction to Financial Options</p> <p>Derivative; foreign exchange; random walks and Markov processes; Ito's lemma; Black-Sholes equations; hedging.</p> </td> </tr> <tr> <td> <p>2. Computational Tools for Finance</p> <p>Numerical methods for PDEs; finite difference methods; Monte Carlo simulation; modeling tools for financial options.</p> </td> </tr> <tr> <td> <p>3. Computational Intelligence Techniques for Financial Problems</p> <p>Prediction; forecasting; classification; technical analysis; artificial intelligence techniques; financial data mining and information retrieval.</p> </td> </tr> </tbody> </table>	Topic	<p>1. Introduction to Financial Options</p> <p>Derivative; foreign exchange; random walks and Markov processes; Ito's lemma; Black-Sholes equations; hedging.</p>	<p>2. Computational Tools for Finance</p> <p>Numerical methods for PDEs; finite difference methods; Monte Carlo simulation; modeling tools for financial options.</p>	<p>3. Computational Intelligence Techniques for Financial Problems</p> <p>Prediction; forecasting; classification; technical analysis; artificial intelligence techniques; financial data mining and information retrieval.</p>
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	<p>4. Case Studies</p> <p>Customer credit risk analysis; foreign exchange forecast, etc.</p>																																																				
	<p>Case Study:</p> <p>Seminars are held for students to discuss in-depth real-life cases related to the subject's topics, to give presentations and write reports.</p>																																																				
Teaching/ Learning Methodology	<p>Teaching is based on lectures in which ethical issues of finance is 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. This project is typically a group project.</p>																																																				
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**Reading List
and References**

Reference Books:

1. Neftci, Salih N., *Principles of Financial Engineering*, 2nd Edition, Academic Press, 2008.
2. Seydel, Rudiger, *Tools for Computational Finance*, 4th Edition, Springer-Verlag, 2009.
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, John C., *Options, Futures, and Other Derivatives*, 8th Edition, Prentice Hall, 2012.
7. McKinney, Wes, *Python for Data Analysis*, O'Reilly, 2012.