

Subject Description Form

Subject Code	AMA541
Subject Title	Simulation and Risk Analysis
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	Enable students to appreciate the principles and methods of system simulation. Emphasis is placed on the process of translating real-world financial and risk problems into simulation models, and the model building techniques involved.
Intended Learning Outcomes	<p>Upon completion of the subject, students will be able to:</p> <ul style="list-style-type: none"> (a) Explain the basic concepts of simulation and its utility in solving real-world financial and risk problems. (b) Apply mathematical and statistical knowledge and modelling techniques required to construct simulation models for real-world systems. (c) Apply statistical knowledge and techniques to verify and validate simulation models. (d) Analyze and interpret simulation outputs. (e) Present results of simulation analysis.
Subject Synopsis/ Indicative Syllabus	<p>Fundamental of Simulation Models: Principles of mathematical simulation, advantages and disadvantages of simulation, types of simulation models, steps in a simulation study.</p> <p>Discrete-Event Simulation: General principles, components and organization of a discrete-event simulation model, simulation examples (e.g. queueing and inventory systems, financial and risk models), event scheduling, gathering summary statistics.</p> <p>Random Numbers and Random Variates: Generation of pseudo-random numbers, Statistical tests of randomness, generation of random variates, inverse transformation method, acceptance-rejection method.</p> <p>Simulation of Risk: Failure Rates: Weibull Distribution. Insurance and Financial Risks: Non-homogeneous Poisson process, Mixed Poisson process, Cox process, Renewal process.</p> <p>Tactical Planning in Simulation Models: Starting condition and equilibrium, problem of variability, estimation of population parameters, determination of sample size, variance reduction techniques.</p>

	<p>Verification and Validation: Verification and validation of simulation models, comparisons, appropriate statistical tests, sensitivity analysis, simulation run statistics, replication of runs, elimination of initial bias, batch means, and regenerative techniques.</p> <p>Computer Language for Simulation: General-purpose and special-purpose languages (e.g. SIMNET II) for simulation.</p>																																												
Teaching/Learning Methodology	<p>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 and statistical techniques and how the techniques can be applied to solving problems. Students are encouraged to adopt a deep study approach by employing high level cognitive strategies, such as critical and evaluative thinking, relating, integrating and applying theories to practice.</p>																																												
Assessment Methods in Alignment with Intended Learning Outcomes	<table border="1"> <thead> <tr> <th rowspan="2">Specific assessment methods/tasks</th> <th rowspan="2">% weighting</th> <th colspan="5">Intended subject learning outcomes to be assessed (Please tick as appropriate)</th> </tr> <tr> <th>a</th> <th>b</th> <th>c</th> <th>d</th> <th>e</th> </tr> </thead> <tbody> <tr> <td>1. Assignments/Projects</td> <td>20%</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> <tr> <td>2. Tests</td> <td>20%</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> <tr> <td>3. Examination</td> <td>60%</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> <tr> <td>Total</td> <td>100 %</td> <td colspan="5"></td> </tr> </tbody> </table> <p>(a), (b), (c) and (d) will be assessed by assignment/test, case study/project and final examination. (e) will be assessed by case study/project. Typical case study/project includes inventory management, queueing system, financial model, and/or risk management models.</p>					Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)					a	b	c	d	e	1. Assignments/Projects	20%	✓	✓	✓	✓	✓	2. Tests	20%	✓	✓	✓	✓	✓	3. Examination	60%	✓	✓	✓	✓	✓	Total	100 %					
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3. Examination	60%	✓	✓	✓	✓	✓																																							
Total	100 %																																												
Student Study Effort Required	Class contact:																																												
	▪ Lecture				26 Hrs.																																								
	▪ Tutorial				13 Hrs.																																								
	Other student study effort:																																												
	▪ Assignment/Project				58 Hrs.																																								
	▪ Self-study				40 Hrs.																																								
	Total student study effort					137 Hrs.																																							
Reading List and References	Bank, J., Carson, J.S., Nelson, B.L. and Nicol, D.M.	Discrete-Event System Simulation, 5 th Edition	Prentice Hall, 2010																																										
	McDonald, R.L.	Derivatives Markets,	Pearson, 2013																																										

		3 rd Edition	
	Ross, S.M.	Simulation, 5 th Edition	Academic Press, 2013
	Ross, S.M.	A Course in Simulation	MacMillan, 1991
	Selia, A.F., Ceric, V. and Tadikamalla, P.	Applied Simulation Modeling	Thomson, Brooks/Cole, 2003