Subject Description Form

Subject Code	AMA518
Subject Title	Simulation
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	**Exclusion:** Pass in "Simulation" of PolyU BSc (Hons) in Applied Mathematics
Objectives	To enable students to appreciate the principles and methods of system simulation. Emphasis is placed on the process of translating real-world problems into simulation models, and the model building techniques involved.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: (a) Explain the basic concepts of simulation and its utility in solving real-world problems. (b) Apply 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	Fundamental of Simulation Models: Principles of mathematical simulation, advantages and disadvantages of simulation, types of simulation models, steps in a simulation study. Discrete-Event Simulation: General principles, components and organization of a discrete-event simulation model, simulation examples (e.g. queueing and inventory systems), event scheduling, gathering summary statistics. Random Numbers: Generation of pseudo-random numbers, mid-square method, congruential methods, statistical tests of randomness. Random Variates: Generation of random variates, inverse transformation method, acceptance-rejection method, comparison of the methods, generation of random variates of discrete and continuous theoretical distributions. Tactical Planning in Simulation Models: Starting condition and equilibrium, problem of variability, estimation of population parameters, determination of sample size, variance reduction techniques.

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<tr><td></td><td>Validity and Analysis:
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.

Computer Language for Discrete-Event Simulation:
Learn programming with the statistical computing software R.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>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 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.</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="5">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></tr>
<tr><td>1. Assignments</td><td>30%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>2. Mid-term test</td><td>20%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>3. Examination</td><td>50%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Total</td><td>100 %</td><td colspan="5"></td></tr>
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Continuous Assessment comprises of assignments (including a mini project report), and a mid-term test. A written examination is held at the end of the semester.</td></tr>
<tr><td>Student Study Effort Required</td><td>
<table>
<tr><td>Class contact:</td><td></td></tr>
<tr><td>▪ Lecture</td><td>26 Hrs.</td></tr>
<tr><td>▪ Tutorial</td><td>13 Hrs.</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>▪ Mini-project</td><td>18 Hrs.</td></tr>
<tr><td>▪ Laboratory (unsupervised)</td><td>40 Hrs.</td></tr>
<tr><td>▪ Private-study</td><td>40 Hrs.</td></tr>
<tr><td>Total student study effort</td><td>137 Hrs.</td></tr>
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Reading List and References	Banks, J., Carson II, J.S., Nelson, B.L., and Nicol, D.M.	Discrete-Event System Simulation, 5th edition	Prentice Hall, 2010
	Ross, S.M.	Simulation, 4th Edition	Academic Press, 2006
	Ross, S.M.	A Course in Simulation	MacMillan, 1991
	Law, A.M. and Kelton, W.D.	Simulation Modeling and Analysis, 4th Edition	McGraw-Hill, 2007
	McDonald, R.L.	Derivatives Markets (Chapter 19), 2nd Edition	Addison-Wesley, 2006