Subject Description Form

Subject Code	AMA4688
Subject Title	Simulation
Credit Value	3
Level	4
Pre-requisite	Introduction to Statistics for Business (AMA1501) or Introduction to Statistics (AMA1502/AMA1602) or Statistics for Finance Analytics (AMA2601) or Introduction to Statistics (AMA2634) or Statistics for Data Science (AMA3631) or equivalent
Exclusion	Simulation (AMA488)
Objectives	This subject is 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 satisfactory completion of the subject, students should be able to: a. identify 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; f. communicate effectively in a well-structured manner and build up an open-minded attitude.
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. production, queuing 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*

<table>
<tr><td></td><td>Generation of random variates, inverse transformation method, acceptance-rejection method, comparison of the methods, generation of random variates of discrete and continuous theoretical distributions, Monte Carlo method and its applications.

Tactical Planning in Simulation Models
Starting condition and equilibrium, problem of variability, estimation of population parameters, determination of sample size, variance reduction techniques.

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 lectures will be conducted to introduce the simulation concepts of the topics in the syllabus, which are then reinforced by learning activities involving demonstration, tutorial exercise and project.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><td rowspan="2">Specific assessment methods</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>25%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>2. Assignments/Tests</td><td>25%</td><td>✓</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><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 subject focuses on knowledge, skill and understanding of <u>Simulation</u>, thus, <u>Exam-based assessment</u> is the most appropriate assessment method, including 25% test / quizzes and 50% examination. Moreover, 25% project is included as a component of continuous assessment so as to assess students' ability in constructing simulation models for real world problems and presenting results of simulation analyses.
Continuous Assessment comprises of a project, quizzes and/or tests. A written examination is held at the end of the semester.</td></tr>
<tr><td rowspan="2">Student Study Effort Expected</td><td>Class contact:</td><td></td></tr>
<tr><td>▪ Lecture</td><td>26 Hrs.</td></tr>
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	▪ Tutorial	13 Hrs.
	Other student study effort:	
	▪ Project	56 Hrs.
	▪ Self-study	22 Hrs.
	Total student study effort	117 Hrs.
Reading List and References	Textbook: Ross, S.M. — Simulation 5th edition — Academic Press 2012 Reference Book: Law, A.M. & Kelton, W.D. — Simulation Modelling and Analysis 4th edition — McGraw Hall 2012	