Subject Description Form

Subject Code	AMA385
Subject Title	Operations Research Methods
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: Calculus (AMA140 or AMA150) or Mathematics I (AMA201) or Introduction to Calculus & Linear Algebra (AMA211) or Mathematics I (AMA280) or Mathematics (AMA284) or Engineering Mathematics I (AMA286) or Mathematics for Scientists & Engineers (AMA288)
Objectives	This subject is to introduce students to the techniques for solving operations research problems and to enable them to choose the correct techniques to suit a particular problem with applications in resource management, network models, decision analysis, inventory management, queuing management, and project management.
Intended Learning Outcomes	Upon satisfactory completion of the subject, students should be able to: 1. implement several basic deterministic and stochastic operations research models; 2. synthesize the mathematical knowledge and techniques required in operations research model formulation; 3. identify, define and formulate operations research problems in a systemic approach; 4. execute and appraise the main algorithms for solving such operations research problems; 5. interpret the results of these operations research algorithms; 6. evaluate critically for improvement in solutions; 7. communicate effectively in a well-structured manner and build up an open-minded attitude.
Subject Synopsis/ Indicative Syllabus	*Network flow models (7 hours)* Shortest path problem, critical path problem (PERT), minimal spanning tree problem, maximal flow problem. *Integer programming models (6 hours)* Formulate operations research problems as integer programming, related decisions, exclusive decisions, contingent decisions, either-or constraints, fixed charge problems, total unimodularity, branch and bound method. *Decision analysis (6 hours)* Decision-making under risk or uncertainty, minimax criterion, Bayes' analysis, decision making with experimentation, posterior distribution, value of perfect information, value of experimentation. *Inventory management (9 hours)* Deterministic inventory model, continuous review, shortage allowed, quantity discounts, periodic review, stochastic inventory model.

Queuing theory (6 hours)
Structure of queuing models, input source, queuing system, inter-arrival time, service time, exponential distribution, Poisson distribution, birth-death process, steady state, M/M/1 system.

Linear Programming (8 hours)
Modeling with linear programming; simplex method; sensitivity analysis.

Teaching/Learning Methodology

The subject will be delivered mainly through lectures and tutorials. The lectures will be conducted to introduce the basic operation research concepts and techniques of the topics in the syllabus, which are then reinforced by learning activities involving demonstration, tutorial exercise and assignments/quizzes.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)						
		1	2	3	4	5	6	7
a. Assignments/Quizzes	15%		✓	✓	✓	✓	✓	✓
b. Tests	25%		✓	✓	✓	✓	✓	✓
c. Examination	60%	✓	✓	✓	✓	✓	✓	
Total	100 %							

Continuous Assessment comprises of assignments and/or quizzes, and tests. A written examination is held at the end of the semester.

To pass this subject, students are required to obtain Grade D or above in **both** the Continuous Assessment and the Examination components in order to satisfy all the intended learning outcomes.

Student Study Effort Required

Class contact:	
▪ Lecture	28 Hrs.
▪ Tutorial	14 Hrs.
Other student study effort:	
▪ Assignment	15 Hrs.
▪ Self-study	55 Hrs.
Total student study effort	112 Hrs.

Reading List and References

Textbook:

Taha, H.A.	Operations Research, An Introduction 9th edition	Prentice Hall 2010

References:

	Hiller, F.S. & Lieberman, G.J.	Introduction to Operations Research 9th edition	McGraw Hill 2010
	Johnson, R., Miller, I. & Freund, J.E.	Miller & Freund's Probability and Statistics for Engineers 8th edition	Prentice Hall 2010
	Winston, W.L.	Operations Research: Applications and Algorithms 4th edition	Duxbury Press 2003
	Nahmias, Steven.	Production and Operations Analysis 6th edition	McGraw Hill 2009