Subject Description Form

Subject Code	AMA456
Subject Title	Graphs and Networks
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	This module aims at preparing students (i) to be able to model real life problems with discrete mathematical models; and (ii) to be able to solve mathematical systems with finite mathematics techniques.
Intended Learning Outcomes	Upon satisfactory completion of the subject, students should be able to: 1. apply mathematics knowledge to graphs and networks; 2. apply mathematical techniques to analyze discrete mathematical models; 3. develop and apply the discrete mathematical tools for solving real life problems as well as daily life applications such as networks and scheduling problems; 4. work independently as well as in a team for a project in operations research.
Subject Synopsis/ Indicative Syllabus	*Graph and Networks* Graph and Digraph; arc; node; subgraphs: acyclic graphs; trees; spanning trees; the minimal spanning tree and its applications in minimum connection problems. The shortest route problems: Dijkstra's method; Eulerian and Hamiltonian graphs: the travelling salesman problem; Chinese postman problems. Non-polynomial completeness. Some examples of real life networks. *Network Flows* Network flows: flow augmenting path; maximum flow; minimum cut; the Fulkerson's theorem. Practical problems related to network flows. Application to multicommodity flows, scheduling, transshipment, transportation and circuit design problem etc. Matching problems: bipartite matching; basic matching algorithms, some practical examples.
Teaching/Learning Methodology	A 2 hour lecture will be conducted each week to initiate students into the definition and concepts in discrete mathematics as described in the syllabus, then, reinforced by a one hour tutorial designed to consolidate and develop student's knowledge through concrete examples and practical applications of graph theory by problem solving.

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
a. Assignments	5%	✓	✓	✓	✓
b. Tests	35%	✓	✓		
c. Examination	60%	✓	✓	✓	✓
Total	100 %				

Continuous Assessment comprises of assignments and mid-term test. A 2-hour examination is held at the end of the semester. Questions used in assignments, tests and examination are used to assess the students level of understanding of the basic concepts and their ability to convert daily problems to mathematical models.

To pass this subject, students are required to obtain Grade D or above in <u>both</u> the Continuous Assessment and the Examination components.

Student Study Effort Expected

Class contact:	
▪ Lecture	26 Hrs.
▪ Tutorial	13 Hrs.
Other student study effort:	
▪ Assignment	36 Hrs.
▪ Self-study	42 Hrs.
Total student study effort	117 Hrs.

Reading List and References	Textbook:		
	D.B. West	Introduction to Graph Theory	Prentice Hall, 1996
	References:		
	S.M. Cioaba M.R. Murty	A First Course in Graph Theory and Combinations	Hindustan Book Agency 2009
	M.S. Bazaraa, J.J. Jarvis and H.D. Sherali	Linear Programming and Network Flows, 2nd edition	Wiley, 1990
	J.R. Evans and E. Minieka	Optimization Algorithms for Networks and Graphs	Marcel-Dekker, 1992
	R.J. Wilson	Introduction to Graph Theory	Longman, 1996 (4th edition)
	G. Chartrand, D.R. Dellermann	Applied and Algorithmic Graph Theory	McGraw Hill 1993