Subject Description Form

Subject Code	AMA506
Subject Title	Graphs and Networks
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	This subject aims at preparing students to be able to (i) Model real life problems with discrete mathematical models; and (ii) Solve graph and network problems with finite mathematics techniques.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: (a) Establish network models for practical problems. (b) Describe network structures. (c) Work out the optimal solution for matching and assignment problems. (d) Describe the property of dual optimal solution of minimum cost flow problems. (e) Calculate the optimal flow for minimum cost flow problems.
Subject Synopsis/ Indicative Syllabus	Graphs: graph and digraph, graph representation, path and circuit, tree and spanning tree, steiner tree, Euler and Hamilton path, graph modeling and applications. Networks: shortest path problem, minimum cost flow problem, maximal flow problem, assignment problem, transportation problem, painted network problem, out-of-kilter algorithm, dual network optimization problem. Case studies/Mini-projects: Knapsack problem, matching problem, multi-commodity flow problem, traveling salesman problem, location problem, and project network.
Teaching/Learning Methodology	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.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)				
		a	b	c	d	e
1. Assignments	20%	✓	✓	✓	✓	✓
2. Mid-term test	30%	✓	✓	✓	✓	
3. Examination	50%	✓	✓	✓	✓	✓
Total	100 %					

Continuous Assessment comprises of assignments and a mid-term test. A written examination is held at the end of the semester.

Student Study Effort Required

Class contact:	
▪ Lecture	26 Hrs.
▪ Tutorial	13 Hrs.
Other student study effort:	
▪ Assignment	20 Hrs.
▪ Case study/Mini-project	38 Hrs.
▪ Self-study	40 Hrs.
Total student study effort	137 Hrs.

Reading List and References

R.K. Ahuja, T.L. Magnanti and J.B. Orlin	Network Flows: Theory, Algorithms, and Applications	Prentice Hall, 1993
J.R. Evans and E. Minieka	Optimization Algorithms for Networks and Graphs, 2nd Edition	Marcel Dekker Inc, 1992
D.B. West	Introduction to Graph Theory, 2nd Edition	Prentice Hall, 2001
C. J. Goh and X. Q. Yang	Duality in Optimization and Variational Inequalities	Taylor & Francis 2002
W. L. Winston and M. Venkataramanan	Introduction to Mathematical Programming, Operations Research: Volume One, 4th Edition	Brooks/Cole-Thomson Learning, 2003