

Subject Description Form

Subject Code	AMA544
Subject Title	Multi-criteria Optimization
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: AMA502 Operations Research Methods
Objectives	This subject aims at preparing students to be able to (i) Model real life problems with multicriteria optimization models; and (ii) Solve multicriteria optimization problems with mathematics techniques.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: (a) Establish multicriteria optimization models for practical problems. (b) Describe multicriteria optimization solution structures. (c) Appreciate multicriteria optimization methods. (d) Solve bicriteria linear optimization problems.
Subject Synopsis/ Indicative Syllabus	Partial orderings, Pareto solutions, vector-valued convex functions, multicriteria optimization models. Kuhn-Tucker optimality condition, multicriteria linear optimization problem, solution structures. Weighted sum approach, multicriteria simplex method. Multicriteria optimization applications: bicriteria shortest path, bicriteria portfolio linear optimization.
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
	1. Assignments	20%	✓	✓	✓	✓
2. Mid-term test	20%	✓	✓	✓	✓	
3. Examination	60%	✓	✓	✓	✓	
Total	100 %					
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	Jahn, J.	Vector Optimization, Theory, Applications, and Extensions	Springer, 2004			
	Ehrgott, M.	Multicriteria Optimization	Springer, 2005			
	Chen, G.Y., Huang, X.X., and Yang, X.Q.	Vector Optimization, Set-valued and Variational Analysis	Springer, 2005			
	Chankong, V., and Haimes, Y.Y.	Multiobjective Decision Making: Theory and Methodology	North-Holland, 1983			
	Collette Y., and Siarry, P.	Multiobjective Optimization: Principles and Case Studies	Springer, 2013			
	Sawaragi, Y., Nakayama, H., and Tanino, T.	Theory of Multiobjective Optimization	Academic Press, New York, 1985			
	X.Q. Cai, K.L. Teo, X.Q. Yang and X.Y. Zhou, Portfolio Optimization under a Minimax Rule, Management Science, Vol. 46 (2000) pp. 957-972.					