Subject Description Form

Subject Code	AMA527
Subject Title	Decision Analysis
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	Enables students to understand the theory and methods for decision analysis under uncertainty, to appreciate the use of expert judgement and value of information in decision making and risk management, and to apply them in industrial and financial areas.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: (a) Describe the basic principles and assumptions for decision analysis. (b) Integrate the decision making knowledge and techniques required in solving real-life problems. (c) Collect data and formulate mathematical models for practical decision problems. (d) Solve decision problems and present decision analysis results. (e) Make recommendations for actions based on analysis results and abide by professional, ethical and social responsibilities.
Subject Synopsis/ Indicative Syllabus	<u>Preliminary probability theory</u> Review of probability theory, prior and posterior distributions, Bayes' theorem. <u>Structure of decision analysis models</u> Definition of a decision analysis model, classification of decision analysis models, decision trees, decision analysis with sampling. <u>Decision analysis under uncertainty</u> Loss functions, the maximin criterion, the minimax regret criterion, the maximax criterion, Bayes decision criterion, two-person zero-sum games, utility functions. <u>Decision analysis with sampling</u> Likelihood function, risk function associated with a decision rule, Bayes measure of a decision rule and the Bayes Decision Rule, convex set of decision rules and admissible decision rules, Monte Carlo Methods. <u>Applications</u> Capital investment, bidding and purchasing, inventory control, insurance policy, other industrial and financial applications.

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	20%	✓	✓	✓	✓	✓
3. Examination	60%	✓	✓	✓	✓	✓
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

Pratt, J.W., Raiffa, H. and Schlaifer, R.	Introduction to Statistical Decision Theory	MIT Press, 2008
G. Owen, Game Theory	Emerald Group Publishing Limited, 4th Edition	August 8, 2013
W. L. Winston,	Operations Research, Cengage Learning, 4th Edition	July 25, 2003
G.Y. Chen, X.X. Huang, X.Q. Yang	Vector Optimization: Set-valued and Variational Analysis.	Springer, August 23, 2005

	Goodwin, P. and Wright, G.	Decision Analysis for Management Judgment, 5th Edition	Wiley, 2014
	Golub, A.L.	Decision Analysis: An Integrated Approach	New York, Wiley, 1997