Subject Description Form

Subject Code	AMA505
Subject Title	Optimization Methods
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	To enable students to use more advanced mathematical and computational techniques applicable in solving real engineering and management problems.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: (a) Solve linear programming problems by simplex methods. (b) Apply linear programming in solving practical problems. (c) Solve constrained and unconstrained optimization problems.
Subject Synopsis/ Indicative Syllabus	Linear Optimization Methods Simplex method; Two-phase methods; sensitivity analysis, application of linear programming in practical problems such as resource allocation in industry, transportation problems and game theory models in strategic planning and economics. Nonlinear Programming Methods Unconstrained optimization: One dimensional search algorithms: Fibonacci and golden section search. Multidimensional search method: Steepest descent method; Newton's method; conjugate gradient method, quasi-Newton methods, and trust region method. Constrained optimization: Kuhn-Tucker condition for optimality, application to solution of simple nonlinear problems; quadratic programming and convex programming problems. Penalty and barrier functions. Application of nonlinear programming in parameter estimation, model identification and other technological problems.
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
1. Assignments	10%	✓	✓	✓
2. Mid-term test	30%	✓	✓	✓
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

Bazaraa, M.S. Shetty, C.M. and Sherali, H.D.	Nonlinear Programming: Theory and Algorithms, 4th Edition	Wiley-Interscience, 2010
Nocedal, J. and Wright, S.J.	Numerical Optimization, 2nd Edition	Springer, 2006
Dennis, J.E. and Schnabel, R.B.	Numerical Methods for Unconstrained Optimization and Nonlinear Equations	SIAM, 1996
Mangasarian, O.L.	Nonlinear Programming	SIAM, 1994
Rockafellar, R.T.	Convex Analysis	Princeton University Press, 1970