Subject Description Form

Subject Code	AMA547
Subject Title	Stochastic Optimization
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	**Pre-requisite:** AMA528 Probability and Stochastic Models; AMA542 Advanced Operations Research Methods
Objectives	To enable students to have a thorough understanding of computational methods for solving stochastic optimization problems and stochastic equilibrium problems. Optimization problems involving stochastic models occur in almost all areas, such as economics, transportation engineering, telecommunications, finance, etc. This lecture focuses on optimization problems involving uncertain parameters and covers the theoretical foundations and recent advances in areas where stochastic optimization are available.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: (a) Apply the concepts and terminology of theoretical properties and numerical solution techniques for optimization problems with random parameters (multistage stochastic programs, optimal stochastic decision processes, stochastic equilibrium). (b) Use numerical methods for finding approximate solutions of stochastic optimization problems. (c) Integrate the knowledge and techniques in some practical applications to economics, finance, risk management, and engineering. (d) Apply mathematical knowledge to determine the current state of the theory on chance (probabilistic) constraints, including the structure of the problems, optimality theory, and duality; and statistical inference in and risk-averse approaches to stochastic programming.
Subject Synopsis/ Indicative Syllabus	Stochastic programming models, two stage stochastic linear programming problems, stochastic linear complementarity problem, stochastic linear/nonlinear variational inequalities, risk measures and risk averse optimization, sample average approximation, expected residual minimization.
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 real problems. Students are encouraged to adopt new and efficient learning techniques for stochastic optimization with examples illustrating the practical application of these techniques.

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. Tests	30%	✓	✓	✓	
3. Examination	50%	✓	✓	✓	✓
Total	100 %				

Continuous Assessment comprises of assignments and tests. 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/Mini-project	38 Hrs.
▪ Self-study	60 Hrs.
Total student study effort	137 Hrs.

Reading List and References

Birge, J.R., and Louveaux, F.	Introduction to Stochastic Optimization	Springer, 1997
Shapiro, A., Dentcheva, D., and Ruszczynski, A.	Lectures on Stochastic Programming: Modeling and Theory	MPS-SIAM Series, 2009