Subject Description Form

Subject Code	AMA617
Subject Title	Optimal Stopping and Stochastic Control in Mathematical Finance
Credit Value	3
Level	6
Pre-requisite/ Co-requisite/ Exclusion	A course in stochastic calculus and a course in partial differential equations
Objectives	This subject is to introduce students to the fundamental theory of optimal stopping and stochastic control in finance.
Intended Learning Outcomes *(Note 1)*	Upon completion of the subject, students will be able to: a. Gain a deep understanding of the American option pricing model, portfolio selection problems with and without market frictions, and capital structure models. b. Learn how to conduct theoretical analysis for optimal stopping time problems and singular stochastic control problems; c. Gain a basic knowledge of the finite difference method for HJB equations arising from finance.
Subject Synopsis/ Indicative Syllabus *(Note 2)*	American option pricing, Merton's model, dynamic mean-variance analysis, Merton's model with transaction costs, and Merton's problem with capital gains taxes, capital structure, time-inconsistency, optimal stopping problems, stochastic control, singular control, impulse control, HJB equations, viscosity solutions, variational inequality equations, numerical solutions, etc.
Teaching/Learning Methodology *(Note 3)*	The subject will be delivered mainly through lectures and tutorials. Assignments and projects will be also given.

Assessment Methods in Alignment with Intended Learning Outcomes

(Note 4)

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)		
		a	b	c
1. CA	50%	√	√	√
2. Exam	50%	√	√	√
Total	100%			

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

The subject focuses on knowledge and understanding of optimal stopping and stochastic control problems arising from finance. A final exam (50%) is an appropriate way to examine students' learning effect. Continuous Assessment (50%) comprises of assignments and projects, which are designed to evaluate students' progress.

Student Study Effort Expected

Class contact:	
▪ Lecture	26 Hrs.
▪ Tutorial	13 Hrs.
Other student study effort:	
▪ Assignment/ mini-project	36Hrs.
▪ Self-study	36Hrs.
Total student study effort	111Hrs.

Reading List and References

1. Fleming, W. H., and Soner, H. M. (2006). Controlled Markov Processes and Viscosity Solutions. Springer Science & Business Media.
2. Huyen Pham (2010). Continuous-time Stochastic Control and Optimization with Financial Applications, Springer.
3. Steven E. Shreve (2004). Stochastic Calculus for Finance, Volume II: Continuous-Time Models. Springer-Verlag, New York.
4. Jiongmin Yong and Xun Yu Zhou (1999). Stochastic Controls: Hamiltonian Systems and HJB Equations. Springer-Verlag, New York.

Note 1: Intended Learning Outcomes

Intended learning outcomes should state what students should be able to do or attain upon subject completion. Subject outcomes are expected to contribute to the attainment of the overall programme outcomes.

Note 2: Subject Synopsis/Indicative Syllabus

The syllabus should adequately address the intended learning outcomes. At the same time, overcrowding of the syllabus should be avoided.

Note 3: Teaching/Learning Methodology

This section should include a brief description of the teaching and learning methods to be employed to facilitate learning, and a justification of how the methods are aligned with the intended learning outcomes of the subject.

Note 4: Assessment Method

This section should include the assessment method(s) to be used and its relative weighting, and indicate which of the subject intended learning outcomes that each method is intended to assess. It should also provide a brief explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes.