數學系課程核心教材內容

課程名稱：(中文) 隨機微積分				開課單位	數學碩士班
(英文) Stochastic calculus				課程代碼	2405003
學分數	3	必/選修	選修	開課年級	一

教學目標：Understanding and performing stochastic integrals with respect to Brownian motion and martingales. Calculations related to Ito's formula and the applications thereof.

課程概述：This course provides an introduction to stochastic integration theory for Brownian motion and martingales, Ito's formula and the related topics.

先修科目或先備能力：Discrete time martingale theory, Real analysis, stochastic process, probability theory

建議參考書目	Karatzas and Shreve, Brownian motion and stochastic calculus Klebaner, Introduction to stochastic calculus with aplications

課程大綱

單元主題	內容綱要	上課週數
Martingale theory	Conditional expectation. Martingale, submartingale, and supermartingale. Upcrossing and downcrossing inequalities. Stopping times. Doob's inequality. Martingale convergence theorems. Uniform integrability. Optional stopping theorem.	4
Stochastic integral for Brownian motion	Brownian motion and its properties. Wiener integral and Ito integral. Stochastic processes defined by Ito integrals. Riemann sum and stochastic integrals.	4
The Ito formula and its applications	Ito's formula and its proof. Multidimensional Ito's formula. Evaluate of stochastic integrals. Exponential processes. Girsanov theorem. Tanaka's formula and local time.	4
Stochastic integrals for martingales	Poisson processes. Predictable processes. Doob-Meyer decomposition theorem. Stochastic integrals with respect to martingales. Ito formula for martingales. Levy's characterization theorem. Decomposition and compensators.	4