**Course Outline**

The course focus on studying behaviors of some special random process such as Poisson process, Compound Poisson process, Markov chain and *Brownian motion* which is used to construct Ito integral – one of the most important part of stochastic calculus. One of the main course outcome is solving stochastic differential equation by 2 different approaches

* Find solution in closed - form with help of Ito formula
* Estimate distribution of the solution numerically by simulation Monte Carlo

**Guide to read textbook**

1. Probability review and Introduction to Random process: Chapter 2 – Shreve I
2. Poisson process and Markov chain: Section 5.2 and 6.1 – Dimitri
3. Random walk: Chapter 5 – Shreve I
4. From Random walk to Brownian motion and Brownian motion: Chapter 3 – Shreve II
5. Ito integral and Ito formulas: Chapter 4 – Shreve II
6. Solve stochastic differential equation: Chapter 9– Steel

Martingale

Markov

Passage time distribution

Important properties

Random process

(Stochastic process)

Converge

CLASSIFICATION

**Discrete state**

**Continuous state**

**Discrete state**

**Continuous state**

Poisson process

Random walk **Brownian motion**

Binomial asset pricing model Geometric Brownian motion

Markov chain

Stochastic calculus

Ito integral

Ito Formulas

**Stochastic differential equation**