

## PROBABILISTIC METHODS FOR FINANCE

### TOPICS OF THE COURSE:

#### ***Basics of measure theory***

- Measurability, integration,  $L_p$  spaces and properties.

#### ***Probability theory***

- Probability spaces and random variables.
- Expectation.
- Independence.
- Conditional expectation

#### ***Stochastic processes***

- Stochastic processes in discrete and continuous time.
- Classical type of stochastic processes.

#### ***Martingales***

- Preliminary definitions and examples.
- Supermartingales and Submartingales.
- Properties of Martingales

#### ***Brownian Motion***

- Background material..
- Hitting times.
- Variations and Extensions.
- Markov property for Brownian Motion.

#### ***Ito integral***

- Introduction.
- Construction of the Ito integral.
- Properties of the Ito integral.
- Extensions of the Ito integral.
- Ito's formula.

#### ***Stochastic Differential Equations***

- Examples of SDE.
- Existence and uniqueness result.

#### ***Applications to mathematical finance***

### READING LIST:

- David Williams, "Probability with martingales", Cambridge University Press, 1991.
- A.N. Shiryaev, "Probability", Springer, 1989.
- I. Karatzas and S. Shreve, "Brownian motion and Stochastic calculus", Springer,