Stochastic calculus

The Brownian Motion is a random phenomenon which plays a fundamental role in the theory of stochastic processes. Due to a strongly irregular dynamics, the construction of integrals with respect to this process needs the development of a specific (stochastic) integration theory. In this course, we will then focus on this topic generally called stochastic calculus (or Ito calculus) going from the probabilistic construction of integrals with respect to continuous martingales towards the study of Stochastic Differential Equations (SDEs), processes which are now widely used in modeling.

1 Outline:

- Brownian Motion
- Martingales and Semimartingales
- Stochastic Integrals
- Itô Formula and Applications
- Stochastic Differential Equations

2 References

1. I. Karatzas, S. Shreve, Brownian motion and stochastic calculus.
2. J.F. Le Gall, Mouvement brownien, martingales et calcul stochastique.
3. D. Revuz, M. Yor, Continuous martingales and Brownian motion.
4. C.G. Rogers, D. Williams, Diffusions, Markov processes and martingales.