MAT4700 - Stochastic analysis I.
MAT4711 - Stochastic analysis II.

The terms “stochastic” and “chaotic” (from Greek), “aleatory” and “casual” (from Latin), “random” (from English), et al., are all equivalent and all deal with *uncertainty*.
The study of uncertainty, fascinating by itself, came to be organized and developed as a separate branch of mathematics since the 1930s with the benchmark works of A.N. Kolmogorov, B. de Finetti and N. Wiener. There we find the foundations of the *theory of probability*. Nowadays the field has already been largely developed and several new branches have been specified.
Stochastic analysis is a wide term to indicate the combination and interaction between *classical analysis* and the *theory of probability*. With the help of stochastic analysis better modelling of some physical phenomena was achieved.
In particular *stochastic differential equations* provide an extremely useful way of modelling dynamical behaviours of physical phenomena in which uncertainty plays a key role. The fields of application are several, e.g. physics, mechanics, biology, economics, finance.

Two courses in Stochastic Analysis are provided (MAT4700 and MAT4711), the former is fundamental by its own and it is basic for the latter.

In **MAT4700** we introduce the *Itô* (*non-anticipating*) *stochastic calculus*:

- Stochastic integrals,
- Stochastic derivatives,
- Stochastic differentials

and *stochastic differential equations*. Since this field is truly wide, we will highlight the main results on the most commonly used stochastic differential equations. In particular we will focus on *Itô diffusions* and some of their properties.

In **MAT4711** we focus on some applications to:

- Optimal stopping,
- Stochastic control,
- Mathematical finance.

Both courses are structured in a series of lectures during which the topics are presented and discussed. Some exercises will be suggested to the audience in order to strengthen and deepen the knowledge. The key-points of the solutions of the exercises will be given and discussed in class.

Basic knowledge in *analysis*, *measure theory* (e.g. MAT4300) and *probability theory* (e.g. STK1100 and STK1130) is truly welcome for both courses.
MAT4700 is fundamental for the proper understanding of MAT4711.