Description :

The aim of the CIME-EMS Summer School *Stochastic Methods in Finance* is to provide a broad and accurate knowledge of some of the most up to date and relevant topics in Mathematical Finance. Particular attention will be devoted to the investigation of innovative methods from stochastic analysis that play a fundamental role in the mathematical modeling of finance or insurance.

The School is intended to contribute to the diffusion, among a wide class of researchers, of advanced techniques in stochastic control and optimization and of some recent developments in the theory of stochastic processes and of stochastic differential equations.

The School will also provide an occasion to facilitate and stimulate the scientific discussion between all participants, in particular among young researchers and lecturers.

The proposed outstanding and internationally recognized lecturers have contributed in an essential way to the development of the theory and techniques that constitute the subjects of the Lectures. The financial origin or motivation of the mathematical analysis undertaken will also be presented in a rigorous manner, in order to better understand and appreciate the interface between mathematics and finance.

Motivation for the choice of the topics :

The wide range of research topics related to the modern theory of Mathematical Finance is reflected in the subjects of the five courses:

1) The questions related to the enlargement of the filtration or the changing of probability measures arises naturally when modeling markets where agents have **Partial and/or asymmetric information**. Partial information, as a possible source of incompleteness, is one basic motivation for the intense investigation and modeling of incomplete markets.

2) **Credit risk** is a celebrated area of research, particularly requested by the financial industry. Pricing credit derivatives and modeling and hedging credit risk are some of the currently most studied topics in Mathematical Finance.

3) Stochastic financial mathematics provides relevant tools for the analysis of classical as well as current problems in **Insurance and risk theory**, where the measurement and control of the risk is a fundamental issue for Insurance companies.

4) The theory of backward stochastic differential equation was used by S.Peng to define the notion of g-expectation. These issues and the related concepts of **Nonlinear expectations** and **Nonlinear martingales** can be applied to the investigation of risk measures, which is a prominent topic in Mathematical Finance.

5) The traditional theme of **Utility maximization** received increased and renovated attention from the application to pricing in incomplete markets. This research

theme stimulated important contributions in the theory of semimartingales and in the theory of convex duality.