Department of Mathematics
Faculty of Mathematics & Computer Science
M.Sc. (Applied Mathematics), 3rd Semester

Course Code	AM 304(b)
Course Title	Derivative Pricing and Financial Modelling
Course Credits	04

Course objectives:

The aim of this course is to study the application of the Black-Scholes model to the range of derivative securities encountered in the market, and to the term structure of interest rates. Links between derivative prices and partial differential equations will be indicated and their numerical solution will be covered in detail. Discrepancies between the Black-Scholes model and market data will be described, and alternative models presented.

Minimum pre-requisites:

Course structure:
Introduction to options, futures and the no-arbitrage principle - using this to calculate fair delivery prices for futures.

The Binomial Model for random asset prices and option valuation.

Basics of stochastic calculus and Ito's lemma. Brownian motion and geometric Brownian motion. Stochastic and deterministic processes.

The Black-Scholes analysis. Derivation of the Black-Scholes partial differential equation and the assumptions behind it (i.e. Hedging and no-arbitrage). Formulating the mathematical problem, determining boundary conditions for option pricing problems.

Solving the Black-Scholes equation. Connection with heat conduction equation, solution of the heat conduction equation - similarity solutions and the Dirac delta function. Derivation of the price of European options. European options with continuous dividend yield.

The Greeks and Barrier options. More than one asset. American options.

Lab Practical: Symbolic and numerical solution of Black-Scholes equations. Graphical solutions to various mathematical models in fanace.

Reading Suggestions:

- The mathematics of financial derivatives - P. Wilmott, S.

Howison, J. Dewynne. CUP, 1995.

- An elementary introduction to mathematical finance, 2nd ed. S.M. Ross. CUP, 2003.
- Introduces quantitative finance - Paul Wilmott, 2nd ed. Wiley, 2007.
- A course in financial calculus - A. Etheridge. CUP, 2002.

Evaluation and weightage:

- Mid-semester Test (40%),
- End-semester Test (40%),
- Quiz & assignments (20%).