

FINANCIAL MATHEMATICS

UNIT I : SINGLE PERIOD MODELS:

Definitions from Finance - Pricing a forward - One-step Binary Model - a ternary Model - Characterization of no arbitrage - Risk-Neutral Probability Measure

UNIT II : BINOMIAL TREES AND DISCRETE PARAMETER MARTINGALES:

Multi-period Binary model - American Options - Discrete parameter martingales and Markov processes - Martingale Theorems - Binomial Representation Theorem - Overturn to Continuous models

UNIT III : BROWNIAN MOTION:

Definition of the process - Levy's Construction of Brownian Motion - The Reflection Principle and Scaling - Martingales in Continuous time.

UNIT IV : STOCHASTIC CALCULUS:

Non-differentiability of Stock prices - Stochastic Integration - Ito's formula - Integration by parts and Stochastic Fubini Theorem - Girsanov Theorem - Brownian Martingale Representation Theorem - Geometric Brownian Motion - The Feynman - Kac Representation

UNIT V : BLOCK-SCHOLES MODEL:

Basic Block-Scholes Model - Block-Scholes price and hedge for European Options - Foreign Exchange - Dividends - Bonds - Market price of risk.

TEXT BOOK(S)

[1] Alison Etheridge, A Course in Financial Calculus, Cambridge University Press, Cambridge, 2002.

REFERENCE(S)

1. Martin Baxter and Andrew Rennie, Financial Calculus: An Introduction to Derivatives Pricing, Cambridge University Press, Cambridge, 1996.
2. Damien Lamberton and Bernard Lapeyre, (Translated by Nicolas Rabeau and Francois Mantion),
3. Introduction to Stochastic Calculus Applied to Finance, Chapman and Hall, 1996.
4. Marek Musiela and Marek Rutkowski, Martingale Methods in Financial Modeling, Springer Verlag, New York, 1988.
5. Robert J. Elliott and P. Ekkehard Kopp, Mathematics of Financial Markets, Springer Verlag, New York, 2001 (3rd Printing)