

STOCHASTIC DIFFERENTIAL EQUATIONS

Unit I

Introduction: Stochastic Analogs of Classical Differential Equations, Filtering Problems, Stochastic Approach to Deterministic Boundary Value Problems, Optimal Stopping, Stochastic Control and Mathematical Finance. Some mathematical preliminaries: Probability Spaces, Random Variables and Stochastic Processes and an Important Example: Brownian Motion.

Unit II

Ito Integrals: Construction of the Ito integral, Some Properties of the Ito Integral and Extensions of the Ito Integral.

Unit III

The Ito formula and the Martingale Representation Theorem: The 1-dimensional Ito Formula, the Multi dimensional Ito Formula and the Martingale Representation Theorem. Stochastic Differential Equations: Examples and Some Solution Methods, An Existence and Uniqueness Result and Weak and Strong Solutions.

Unit IV

The Filtering problem: Introduction, The 1- dimensional Linear Filtering Problem and the Multi- dimensional Linear Filtering Problem.

Unit V

Diffusions: Basic Properties: The Markov Property, the Strong Markov Property, the Generator of an Ito Diffusion, the Dynkin Formula, the Characteristic Operator.

Text Book:

“Stochastic Differential Equations - An Introduction with Applications”, by **Bernt Oksendal**, Sixth Edition, Springer-Verlag, Heidelberg, 2003.

Unit I : Chapter 1 and 2

Unit II : Chapter

Unit III: Chapter 4 and 5

Unit IV: Chapter 6

Unit V : Chapter 7.