MATE 354 -STOCHASTIC PROCESSES

OBJECTIVE:

This course is designed for students who are interested in an overview of Stochastic Analysis and their Applications.

Prerequisites: 01-286 or equivalent background in probability theory

Credit: 3 credits
Class Hours: MTTF: 11:00 - 12:00 am.
Office Hours: Tuesdays and Thursdays from 2:00 - 3:00 pm

DESCRIPTION:

1. **Stochastic Processses: Some Notions**
   - Introduction
   - Specification of Stochastic Processes
   - Stationary Processes
2. **Markov Chains**
   - Definitions and properties
   - Higher order transition probabilities
   - Classification of States and Chains
   - Limit Theorems
3. **Poisson Processses**
   - The Poisson Process
   - Generalizations of Poisson Processes
   - Non homogeneous Poisson Process
   - Compound Poisson Process
   - Conditional Poisson Process
4. **Martingales in Discrete Time**
   - Conditional Expectation
   - Martingales
   - Games of Chance
   - Stopping times
   - Optional Stopping Theorem
   - Doob's Martingale Inequalities
   - Martingale Convergence Theorem
5. **Brownian Motion**
   - Preliminaries
   - Random Walks and Diffusion
   - Derivation of the Diffusion Equation
   - Interpolation of Continuous functions
   - Existence of Brownian Motion
   - Properties of Brownian Motion
   - Variations on Brownian Motion
   - Brownian Motion with drift
   - Kolomogorov Equations
   - Ornstein-Uhlenbeck Process

TEXT / REFERENCE BOOKS:

1. **Brzezniak, Z. and Zastawniak, T., Basic Stochastic Processes. Springer, 1999.**
2. **Durrent, R., Essentials of Stochastic Processes, Springer, 1999.**
3. **Karlin, S. and Taylor, H., A First Course in Stochastic Processes. Academic Press, 1996.**
4. **Lawler, G.F., Introduction to Stochastic Processes. Chapman & Hall, 1996.**
5. **Medhi, J.P., Stochastic Processes. John Wiley & Sons Inc., 1994.**
6. **Oksendal, B., Stochastic Differential Equations, Springer, 1998.**
7. **Resnick, S., Adventures in Stochastic Processes. Birkhäuser, 1994.**
8. **Ross, S.M., Stochastic Processes. John Wiley & Sons Inc., 1996.**
9. **Williams, D. Probability and Martingales Cambridge University Press, 1999.**