

TOPICS COVERED:

- General Background (A).** (1) combinatorial analysis and axioms of probability
(2) elementary random variable theory: expectation, variance, moments, distribution function, probability density functions etc
(3) major discrete random variables: bernoulli, binomial, poisson, geometric
major continuous random variables: uniform, normal, exponential
(4) Applications and simple statistical modelling
(5) conditional probability: bayes formula, independence, conditional expectation, prediction, iid random variables
(6) joint distributions, joint distribution functions, marginal distributions,
(7) Moment generating functions and applications

- Measure theory (B).** (B) (1) elementary measure theory- σ -algebras, probability triples, continuity of probabilities, integration, L^p spaces, monotone convergence theorem, Lebesgue measure, Borel-Cantelli lemmas, Chebychevs inequality, Markov's inequality, weak law of large numbers, strong law of large numbers,
(2) Modes of Convergence- almost sure convergence, convergence in probability, L^p convergence, convergence in distribution

- Markov chains and random walks (C).** (C) Markov chain theory
(1) first step analysis
(2) transience, recurrence and irreducibility
(3) stationary distributions and existence theorems
(4) random walks as Markov chains

Recommended Texts:

- A First Look at Rigorous Probability Theory by Jeffrey Rosenthal, 2000. (B,C).
- An Introduction to Stochastic Modelling, Karlin and Taylor, 3rd Edition, 1998, Academic Press
- A First Course in Probability, Sixth Edition by Sheldon Ross, 2002, Prentice Hall (A)
- Probability: theory and Examples, 3rd Edition, Richard Durrett, Duxbury Press
- An Introduction to Probability Theory and Its Applications, Vol 1, 3rd edition, 1968 by William Feller (any edition would be fine) (A,C).
- Probability by Leo Breiman, 1968, Addison- Wesley (B).