

Course Information for Math 340

Introductory Probability

- **Pre-requisites:** Math 150B
- **Books Used:**
 - *A First Course in Probability*, 6th edition, by S. Ross (parts or all of chap 1-8)
 - *Introduction to Probability and Its Applications*, 2nd edition, by R.L. Scheaffer (Chapters 1-6 and Section 7.4; Sections 3.10-3.13, 4.6.5, 4.7, 4.8, 4.11, 4.12, 5.5, 5.8, 5.9, 6.4-6.8 omitted)
 - *Probability*, 1st edition, by J. Pitman (Chapters 1-6 except the optional sections; Sections 6.4 and 6.5 are covered if time allows)
- **Course Description:** In this course students learn the fundamental ideas of probability theory. The topics covered include:
 - Finite and countable additivity rules
 - Conditional probability, independence, and Bayes' rule
 - Partitions, Law of Total Probability, Multiplication rules
 - Venn diagrams, Tree diagrams
 - Combinatorics, Discrete distributions
 - Discrete random variables, mean and standard deviation
 - Binomial distributions; Normal, Skew-Normal, and Poisson approximations to binomial distributions
 - Confidence intervals
 - Discrete joint distributions; Marginal distributions; Independence; Several discrete random variables; Max-Min distributions; Method of Indicators
 - Generating functions
 - Continuous random variables; Density functions; Cumulative probability distribution functions
 - Poisson arrival process; Memoryless property; Hazard rates
 - Continuous joint distributions; Joint density case; Marginal distributions; Independence; Expectation; Variance
 - Independent Normal Variables: Linear combinations; Rotations; Several independent variables;
 - Dependence (Discrete Case): Conditional distributions; Conditional expectation
 - Dependence (Continuous Case): Density case; Conditional distributions; Conditional expectation; Covariance and Correlation

- Limit Laws and Fundamental Theorems Covered Include: The Strong (and Weak) Law of Large Numbers, The Central Limit Theorem, The square root law, Markov's Inequality, Chebychev's Inequality, Law of Total Probability, Law of Total Expectation, Poisson Scatter Theorem
- Named Distributions Covered Include: Uniform (discrete and continuous), Bernoulli, Binomial, Poisson, Geometric, Hypergeometric, Negative binomial, Normal, Exponential, Gamma, Chi-Square, Rayleigh, Cauchy, Beta, Arcsine