NORTH CAROLINA STATE UNIVERSITY
DEPARTMENT OF MATHEMATICS

Course Outline and Syllabus
MA 421 – Introduction to Probability

Text – *A First Course in Probability*, by Ross, Sheldon, 7th Ed., Prentice-Hall 2002

---

1. Basic Concepts—Sample spaces, events, probability functions; basic theorems.

2. Basic Combinatorics—Multiplication and addition principles; ordered and unordered samples, sampling with and without replacement; binomial expansions.

3. Conditional Probability and Independence—Definitions, basic theorems; urn models; independence; repeated trials; conditioning as a strategy in probability; elementary recursions.

4. Discrete Random Variables—Definitions; probability mass and distribution functions; Bernoulli trials; binomial, geometric, negative binomial, Poisson, hypergeometric, and uniform random variables.

5. Continuous Random Variables—Definitions; distribution and density functions; uniform, exponential, and normal random variables; distributions of functions of random variables; sums of random variables.

6. Jointly distributed random variables—Joint densities, probability mass functions, and distribution functions; independent random variables; conditional distributions.

7. Expectation—Definition; expected values of binomial, geometric, Poisson, uniform, exponential, and normal random variables; Variance and covariance; expectations and variances of sums; Conditional expectations; moment generating functions.

8. Limit Theorems—Central limit theorem, Law of large numbers.

9. Stochastic Processes—Poisson processes and Markov processes.