

Syllabus for the First Year Exam (2014)

203: Introduction to Probability Theory

Textbook:

- DeGroot, M.H. and Schervish M.J. Probability and Statistics. Fourth Edition, Addison Wesley.

Course Topics:

- Definition of probability and finite sample spaces. Counting methods. Combinatorial methods. Multinomial coefficients.
- Probability of a union of events. Conditional probability and independent events. Bayes' theorem.
- Discrete random variables. Examples: Bernoulli, Binomial, Hypergeometric, Poisson and Negative Binomial random variables.
- Continuous random variables. Normal, Gamma and Beta distributions.
- Density function. Quantile function.
- Bivariate distributions and marginal distributions.
- Conditional distributions and multivariate distributions.
- Functions of a single random variable. Functions of two or more random variables.
- Expectation and variance. Conditional expectation.
- The normal distribution and properties of normal random variables.
- Markov and Chebyshev's inequalities. The law of large numbers. The central limit theorem.
- The multinomial distribution.
- Markov chains.