Mathematics Department
Brooklyn College, City University of New York
Math 3501 (Probability and Statistics I)
3 hours lecture, 1 hour recitation; 3 credits

Suggested Textbooks:
- A First Course in Probability, by Sheldon Ross
- Probability and Statistical Inference, by Robert Hogg, Elliot Tanis and Dale Zimmerman

1. Descriptive Statistics
   - Graphical Representations for sampled data
   - Measures of Central Tendency
   - Measures of Spread
   - Paired data and sample correlation

2. Combinatorial Analysis
   - Basic Principle of Counting
   - Permutations
   - Combinations
   - Multinomial Coefficients

3. Probability Spaces
   - Sample Spaces and Events
   - Axioms of Probability
   - Equiprobable Spaces
   - Conditional Probability; Bayes' Formula
   - Independence

4. Generalities about Random Variables
   - Cumulative Distribution Function
   - Expectation, Variance
   - Indicator Functions; Expectation of Sums
   - Moment Generating Functions

5. Discrete Random Variables
   - Bernoulli and Binomial Random Variables
   - Poisson Random Variable
   - Geometric and Negative Binomial Random Variables

6. Continuous Random Variables
   - Uniform Random Variable
   - Exponential Random Variables
   - Normal Random Variable
   - Gamma, Beta and Cauchy Random Variables

7. Bivariate Random Variables
   - Joint Distributions
   - Covariance, correlation
   - Independent Random Variables
   - Sums of Independent Random Variables; Convolutions
   - Functions of Random Variables; Change of Variables Formula (Univariate and Bivariate)

8. Limit Theorems
   - Markov and Chebyshev Inequalities; Chernoff Bounds
   - Law of Large Numbers
   - Statement of Central Limit Theorem and Applications