SYLLABUS FOR PROBABILITY AND STATISTICS WRITTEN MASTERS EXAM

1. Probability
   Sample Space
   Probability Axioms
   Probability Rules
   Combinatorics: Probability on Finite Sample Spaces
   Conditional Probability and Bayes Theorem
   Independence of Events

2. Random Variable and Probability Distributions
   Random Variable
   Probability Distribution of a Random Variable
   Discrete and Continuous Random Variables
   Functions of Random Variable

3. Moments and Generating function
   Moments of a Distribution Function
   Expected Value
   Variance
   Higher Moments
   Chebyshev’s Inequality

4. Multiple Random Variables
   Multiple Random Variables
   Independence of Random Variables
   Functions of Random Variables
   Covariance, Correlation, and Moments

5. Some Special Distributions
   Discrete Uniform
   Bernoulli
   Binomial
   Hypergeometric
   Geometric
   Negative Binomial
   Poisson
   Multinomial Distribution

   Uniform
   Gamma
   Exponential
   Chi-Square
   Normal

6. Limit Theorems
Law of Large Numbers
Central Limit Theorem

7. Statistics and Their Distributions
   Normal
   Chi-Square
   t-distribution
   F-distribution

8. Point Estimation
   Method of Moment Estimators
   Maximum Likelihood Estimators
   Unbiased Estimation
   Efficient Estimation
      Cramer-Rao Lower Bound
      Asymptotically Efficient
   Sufficient Estimation
      Factorization Theorem
      Rao-Blackwell Theorem
      Lehmann-Scheffe Theorem
   Consistent Estimation

9. Interval Estimation
   Confidence Intervals for One-Sample Mean
   Confidence Intervals for One-Sample Proportions
   Confidence Intervals for Two-Sample Means
   Confidence Intervals for Two-Sample Proportions
   Sample Size Calculations

10. Hypothesis Testing
    Null and Alternative Hypotheses
    Type I and Type II errors
    Neyman-Pearson Lemma
    Generalized Likelihood Ration Tests

11. Goodness of Fit
    Contingency Tables
    Tests of Independence

12. Regression
    Linear Regression

13. Analysis of Variance
    One-Way Analysis of Variance

References:
• Introduction to Mathematical Statistics by Hogg, Craig
• Mathematical Statistics and Data Analysis by Rice
- Introduction to Probability and Mathematical Statistics by Bain, Englehardt
- Probability and Statistical Inference by Hogg, Tanis
- An Introduction to Probability and Statistics by Rohatgi, Saleh
- Mathematical Statistics by Bickel, Doksum