MA 531: Probability and Statistics (3-1-0:4)

Probability: classical, relative frequency and axiomatic definitions of probability, addition rule and conditional probability, multiplication rule, total probability, Bayes' theorem and independence.

Random variables: discrete, continuous and mixed random variables, probability mass, probability density and cumulative distribution functions, mathematical expectation, moments, moment generating function, Chebyshev's inequality.

Special distributions: discrete uniform, binomial, geometric, negative binomial, hypergeometric, Poisson, uniform, exponential, gamma, normal, beta, lognormal, Cauchy distributions. Functions of a random variable.

Limit theorems: weak law of large numbers, central limit theorem.

Joint Distributions: joint, marginal and conditional distributions, product moments, correlation, independence of random variables, bivariate normal distribution, simplecorrelation, regression.

Sampling Distributions:distributions of the sample mean and the sample variance for a normal population, Chi-Square, t and F distributions.

Estimation: the method of moments and the method of maximum likelihood estimation, properties of best estimates, confidence intervals for the mean(s) and variance(s) of normal populations.

Testing of hypotheses: null and alternative hypotheses, the critical and acceptance regions, two types of error, power of the test, the most powerful test and Neyman-Pearson fundamental lemma, standard tests for one and two sample problems for normal populations.

Text Books and References:

1. W. W. Hines, D. C. Montgomery, D. M. Goldsman and C. M. Borror, "Probability and Statistics in Engineering", Wiley India Pvt. Limited, 4th edition, 2008.
2. S. M. Ross, "Introduction to Probability and Statistics for Engineers and Scientists", Academic Press, 5th edition, 2014.
3. J. S. Milton and J. C. Arnold, "Introduction to Probability and Statistics", McGraw Hill Ed. (India) Pvt. Ltd, 4th edition, 2017.
4. V. K. Rohatgi and A. K. Md. E. Saleh, "An Introduction to Probability and Statistics", Wiley, 2nd edition 2008.
5. B.L.S. Prakasa Rao, "A First Course in Probability and Statistics", Cambridge University Press, 2010.