MSO201A: Probability and Statistics
Spring, 2018

Time: Monday-Thursday-Friday: 8 am – 8.50 am.

Place: L19

Instructor: Subhra Sankar Dhar

Office: 512A, Faculty building.

Telephone: 6950

E-Mail: subhra@iitk.ac.in

Tutorials : Wednesday : 8 am - 8.50 am

Tutors : 1. Prof. Ketan Rajwat, **Venue** : L10, **Roll numbers :** 11263- 160106.
2. Prof. R. K. Bansal, **Venue** : L11, **Roll numbers** : 110108 - 160356.
3. Prof. A. R. Lal, **Venue :** L12, **Roll numbers** : 160357 - 160592.
4. Prof. A. Seth, **Venue** : L13, **Roll numbers** : 160598 - 171173.

Office Hours: To be announced by respective tutors, if any.

References and Reading Materials:

1. Lecture notes.
2. Mathematical Statistics and Data Analysis (Third Edition) : John A. Rice
3. Introduction to Mathematical Statistics (Sixth Edition) : Hogg. McKean. Craig
4. Probability and Statistics for Engineering and the Sciences (Eighth Edition): Jay L. Devore.

Course Contents:

Probability: Classical, relative frequency and axiomatic definitions of probability, addition rule and conditional probability, multiplication rule, theorem of total probability, Bayes' Theorem and independence of events

Random Variables and Distributions: Discrete, continuous and mixed random variables, probability mass, probability density and cumulative distribution functions, mathematical expectation, moments, probability and moment generating function, median and quantiles, Markov inequality, Chebyshev's inequality.

Special Distributions: Discrete uniform, binomial, geometric, negative binomial, hypergeometric, Poisson, continuous uniform, exponential, gamma, Weibull, beta, normal, Cauchy, double exponential distributions

Function of random variables : A few examples.

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

Transformations: functions of random vectors, distributions of order statistics, distributions of sums of random variables

Sampling Distributions: Distributions of the sample mean and the sample variance for a normal population, Chi-Square, t and F distributions. Weak Law of Large Numbers and Central Limit Theorems.

Descriptive Statistics: Graphical representation, measures of locations and variability

Estimation: Unbiasedness, consistency, the method of moments and the method of maximum likelihood estimation, confidence intervals for parameters in one sample and two sample problems of normal populations, confidence intervals for proportions

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, tests for one sample and two sample problems for normal populations, tests for proportions, Chi-square goodness of fit test and its applications

Course policy:

1. The communication for the course will happen through emails. Please feel free to ask questions during the lecture hours.

2. There is NO weightage of attendance on grades. However, the instructor strongly believes that the regular attendance will help the students to perform well in the course.

Important Dates:

January 4, 2018	Classes Begin
February 25 – March 4, 2018	Mid-Semester Recess
April 20, 2018	Last day of classes
Quiz 1	January 24, 2018
Quiz 2	(after mid term) Will be announced in due time
Mid semester exam	Will be announced by the DOAA
End semester exam	Will be announced by the DOAA

Important Notes :

1. There is no make up exam for quizzes and the mid semester examination. If you have a MEDICAL leave approved by the SUGC, then your marks will be prorated. If someone does NOT appear in the end semester examination, s/he will get the at most the passing grade (i.e., D).

2. The homework problems will be given regularly. The students are advised to solve all homework problems since that will be helpful for them to perform well in the quizzes and the semester examinations. However, it is not required to submit the solutions of the homework problems.

The weightage of marks: Quiz 1 (12%), Quiz 2 (13%), Mid semester examination (30%) and end semester examination (45%).

Grading scheme: A (>= 80%), B (>= 65%, < 80%), C (>= 50%, <65%), D (>= 30%, < 50%), E (> = 15%, <30%) and F (< 15%).

Note: The instructor reserves the right to modify the above if necessary.