Probability and Statistics

PROF. SOMESH KUMAR
Department of Mathematics
IIT Kharagpur

TYPE OF COURSE: Rerun | Core | UG/PG
COURSE DURATION: 12 weeks (26 Jul'21 - 15 Oct'21)
EXAM DATE: 23 Oct 2021

PRE-REQUISITES: Must have good knowledge of Differential and Integral Calculus, sequences and series, Basic Linear/ Matrix Algebra (usually students who have completed Mathematics-I and II at first year undergraduate

INDUSTRIES APPLICABLE TO : Today all industries use statistical methods. So for students desirous to work in any type of industry, this course will be indispensable. In particular, companies dealing with Business Analytics, Banking and finance, Insurance, machine learning, data mining etc. this course will be invaluable.

COURSE OUTLINE :

The use of statistical reasoning and methodology is indispensable in modern world. It is applicable to every discipline, be it physical sciences, engineering and technology, economics or social sciences. Much of the advanced research in electronics, electrical, computer science, industrial engineering, biology, genetics, and information science relies increasingly on use of statistical tools. It is essential for the students to get acquainted with the subject of probability and statistics at an early stage. The present course has been designed to introduce the subject to undergraduate/postgraduate students in science and engineering.

ABOUT INSTRUCTOR :

Prof. Somesh Kumar is a professor in the Department of Mathematics, IIT Kharagpur. He has over 32 years of experience of teaching courses on Probability Statistics, Statistical Inference, Sampling Theory, Stochastic Processes, Multivariate Analysis, Regression Analysis, Time Series, Experimental Designs, Decision Theory to undergraduate, postgraduate and doctorate students. His NPTEL courses (under MHRD) on Probability and Statistics, Statistical Inference and Statistical Methods for Scientists and Engineers (each of 40 hours) are available online and very popular.

COURSE PLAN :

Week 01 : Sets, Classes, Collections | Sequence of Sets | Ring, Field (Algebra) | Sigma-Ring, Sigma-Field, Monotone Class | Random Experiment, Events | Definitions of Probability.
Week 02 : Conditional Probability | Independence of Events | Problems in Probability | Random Variables | Probability Distribution of a Random Variable.
Week 03 : Probability Distribution of a Random Variable-II.
Week 04 : Poisson Process | Special Continuous Distributions.
Week 05 : Normal Distribution | Problems on Normal Distribution | Function of a Random Variable.
Week 06 : Joint Distributions | Independence, Product Moments | Linearity Property of Correlation and Examples | Bivariate Normal Distribution.
Week 07 : Additive Properties of Distributions | Transformation of Random Variables | Distribution of Order Statistics | Basic Concepts | Chi-Square Distribution.
Week 08 : t-Distribution | F-Distribution | Descriptive Statistics | Chi-Square Distribution.
Week 09 : Introduction to Estimation | Unbiased and Consistent Estimators | LSE, MME | Examples on MME, MLE.
Week 10 : UMVUE, Sufficiency, Completeness | Rao-Blackwell Theorem and its Applications | Confidence Intervals.
Week 11 : Basic Definitions | Two Types of Errors | Neyman-Pearson Fundamental Lemma | Applications of N-P Lemma.
Week 12 : Testing for Normal Mean | Testing for Normal Variance | Large Sample Test for Variance and Two Sample Problem | Paired t-Test