



STATISTICAL INFERENCE - IIT KGP

PROF. SOMESH KUMAR

Department of Mathematics
IIT Kharagpur

TYPE OF COURSE: Rerun | Elective | UG/PG

COURSE DURATION : 12 weeks (24 Jan' 22 - 15 Apr' 22)

EXAM DATE : 23 Apr 2022

PRE-REQUISITES : Students must have done a basic course in Probability, Distributions and Statistics. They 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 level)

INTENDED AUDIENCE : Students studying Major in Statistics, Mathematics, all engineering disciplines aspiring for a career in data science and data analytics. The students of Computer Science and Engg, Electronics and Communications, Electrical, Industrial, Mechanical, Chemical, Economics, Biotechnology, Mining, Agriculture and Food Technology etc. can take this course

INDUSTRIES APPLICABLE TO : All companies which deal with data/business analytics will recognize this course. 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 :

Sir R.A. Fisher published two seminal papers on the foundations of statistical inference in 1922 and 1925. These and subsequent publication of his book "Statistical Methods for Research Workers" led to a revolutionary use of statistical ideas in all branches of science, engineering, medical, biology and social sciences. Shortly afterwards the testing of hypothesis was given a firm theoretical foundation by J. Neyman and E.S. person in a series of papers. In the last ninety years the two topics of estimation and testing of hypothesis have become inseparable part of any scientific investigation. As the scientists in various areas need to use these methods, the students need to learn the basics of the theory behind these. The present course has been designed to introduce the subject to undergraduate/postgraduate students in science and engineering. The course contains a good introduction to each topic and an advance treatment of theory at a fairly understandable level to the students at this stage. Each concept has been explained through examples and problems.

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. He has also taught Mathematics-I in QEEE program of MHRD to 130 engineering college students in online mode during Autumn 2014-2015. He offered the course "Probability and Statistics" for certification program in Jan-April 2016, Jan-April 2017, Jan-April 2019. He also offered the course "Statistical Inference" for certification program during Jan-April 2019. His lectures on "Probability" and "Permutation and combinations" for class XII students under IIT-PAL scheme of MHRD are also available through DTH channels of national television.

COURSE PLAN :

Week 1 : Introduction and Motivation – I & II; Basic Concepts of Point Estimations – III; Basic Concepts of Point Estimations – IV & V

Week 2 : Basic Concepts of Point Estimations – VI; Finding Estimators – I, II, III & IV

Week 3 : Finding Estimators – V & VI; Properties of MLEs – I & II; Lower Bounds for Variance – I

Week 4 : Lower Bounds for Variance – II, III, IV, V & VI

Week 5 : Lower Bounds of Variance – VII, VIII; Sufficiency – I, II; Sufficiency and Information – I

Week 6 : Sufficiency and Information – II; Minimal Sufficiency, Completeness – I, II; UMVU Estimation, Ancillarity – I & II

Week 7 : Testing of Hypotheses: Basic Concepts – I, II ; Neyman Pearson Fundamental Lemma – I, II ; Application of NP Lemma – I

Week 8 : Application of NP Lemma – II ; UMP Unbiased Tests – II ; UMP Tests – I, II, III & IV

Week 9 : UMP Unbiased Tests – I, II, III & IV; Applications of UMP Unbiased Tests – I & II

Week 10 : Unbiased Tests for Normal Populations – I, II, III & IV; Likelihood Ratio Tests – I & II

Week 11 : Likelihood Ratio Tests – III, IV, V, VI, VII & VIII

Week 12 : Test for Goodness of Fit – I & II; Interval estimation – I, II, III & IV

