APPLIED MULTIVARIATE STATISTICAL MODELING

PROF. JHARESWAR MAITI
Department of Mathematics
IIT KGP

TYPE OF COURSE : Rerun | Core | PG
COURSE DURATION : 12 Weeks (18 Jan' 21 - 09 Apr' 21)
EXAM DATE : 25 Apr 2021

PRE-REQUISITES : Basic Knowledge of Probability and Statistics

INTENDED AUDIENCE : Students of BTech/BE/MTech/ME/MS/MSc/PhD/MBA/PGDBM in Data Science, Engineering, Management, Economics, Other Sciences including Mathematics, and Professionals including Data Scientists, Engineers, Academicians, Managers, Economists, Policy Makers, and Administrators can take it

COURSE OUTLINE :

Data driven decision making is the state of the art today. Engineers today gather huge data and seek meaningful knowledge out of these for interpreting the process behaviour. Scientists do experiments under controlled environment and analyse them to confirm or reject hypotheses. Managers and administrators use the results out of data analysis for day to day decision making. As the data collected and stored are multidimensional, to extract knowledge out of it requires statistical analysis in the multivariate domain. The aim of this course is therefore to build confidence in the students in analysing and interpreting multivariate data. The course will help the students by: (i) Providing guidelines to identify and describe real life problems so that relevant data can be collected, (ii) Linking data generation process with statistical distributions, especially in the multivariate domain, (iii) Linking the relationship among the variables (of a process or system) with multivariate statistical models, (iv) Providing step by step procedure for estimating parameters of a model developed, (v) Analysing errors along with computing overall fit of the models, (vi) Interpreting model results in real life problem solving, and (vii) Providing procedures for model validation.

ABOUT INSTRUCTOR :

Prof. Jhareswar Maiti PhD, Professor, Department of Industrial & Systems Engineering, Indian Institute of Technology (IIT), Kharagpur, He has more than fifteen years of teaching., research and consulting experience on statistical modeling of production and service systems in the areas of Quality Management, Safety Management, Work System Design, and Asset Management. His current research and teaching interests encompass applied data analytics including statistical modeling, machine learning and data mining applications for prediction and decision making. He has published more than 70 papers in international and national journals of repute and more than 30 papers in conference proceedings. Till date, he has supervised 10 PhD candidates to successful completion and currently supervising 8 PhD research candidates. He has been executing a number of Industry-sponsored consulting and Government-funded research projects. He has organized 15+ training programmes and short-term courses for industry participants. A 42 lecture series on "Applied Multivariate Statistical Modeling" of Prof Maiti is available through youtube uploaded by NPTEL (national programme on technology enhanced learning). The current profile of Prof Maiti can be found at IIT Kharagpur website.

COURSE PLAN :

Week 1**:** Introduction to Multivariate statistical modelling; Assignment - 1

Week 2**:** Univariate descriptive statistics; Sampling Distribution; Assignment - 2

Week 3**:** Estimation; Hypothesis Testing; Assignment-3

Week 4**:** Multivariate descriptive statistics; Assignment-4

Week 5**:** Multivariate normal distribution; Assignment-5

Week 6**:** Analysis of variance (ANOVA); Assignment-6

Week 7**:** Multivariate analysis of variance (MANOVA); Assignment-7

Week 8**:** Multiple Linear Regression (MLR): Introduction, Sampling, & Adequacy checking: Assignment-8

Week 9**:** MLR: Test of assumption, and diagnostic study; Assignement-9

Week 10**:** Principal Component Analysis (PCA): Introduction, estimation, adequacy checking, & interpretation; Assignment-10

Week 11**:** Factor Analysis (FA): Introduction, estimation, adequacy checking, factor rotation, & factor scores; Assignment-11

Week 12**:** Structural Equation Modeling (SEM): Introduction, measurement model, & structural model; Assignment-12