



### Design and Analysis of Experiments

Multidisciplinary

**Instructor Name:** Prof J Maiti

**Institute:** IIT Kharagpur

**Department:** Mechanical Engineering

**About Instructor:** J. Maiti, PhD, Professor, Department of Industrial & Systems Engineering, Indian Institute of Technology (IIT), Kharagpur has more than fifteen years of teaching, research and consulting experience on Safety Analytics, Quality Analytics and Engineering Ergonomics. 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 11 PhD candidates to successful completion and currently supervising 8 PhD research candidates. He has been executing a number of Industry-sponsored consulting and Government as well industry funded research projects. He has organized 17 training programmes and short-term courses for industry participants. Prof Maiti has been pursuing research on safety analytics, quality analytics, and engineering ergonomics including the applications of multivariate statistical modeling since 1995. Prof Maiti excels in teaching Safety Analytics, Quality Engineering, Design and Analysis of Experiments (DOE), Six-sigma Fundamentals and Applications, and Applied Multivariate Statistical Modeling. A 42 lecture series on "Applied Multivariate Statistical Modeling" of Prof Maiti is available in Youtube uploaded by NPTEL (national programme on technology enhanced learning). Prof Maiti has been serving the editorial board member of several international journals of repute. Presently he is the editorial board member of Safety Science published by Elsevier Science, International Journal of Injury Control and Safety Promotion, published from Taylor & Francis, and Safety and Health at Work (SHAW) published by Elsevier Science.

**Pre Requisites:** : Probability and statistics

**Core/Elective:** : Elective

**UG/PG:** : Both

**Industry Support** : 1. Manufacturing companies like GM, Tata Motors, Tata Steel 2. Process industries such as ONGC 3. General Electric 4. R&D organizations

**Course Intro:** : The objective of this course is to impart students a holistic view of the fundamentals of experimental designs, analysis tools and techniques, interpretation and applications. Upon completion of this course, the students will know (i) the fundamentals of experiments and its uses, (ii) basic statistics including ANOVA and regression, (iii) experimental designs such as RCBD, BIBD, Latin Square, factorial and fractional factorial designs, (iv) application of statistical models in analysing experimental data, (v) RSM to optimize response of interest from an experiment, and (vi) use of software such as Minitab.

#### COURSE PLAN

SL.NO	Week	Module Name
1	1	Outcome based pedagogic principles for effective teaching
2	2	Basic statistics
3	3	Analysis of Variance (ANOVA)
4	4	Regression
5	5	Experimental designs: Randomized complete block design (RCBD)
6	6	Experimental designs: Variants of RCBD such as Latin Square, central composite design, etc.



7	7	Experimental designs: Full factorial experiments
8	8	Experimental designs: 2k factorial experiments
9	9	Experimental designs: Fractional factorial experiments
10	10	Experimental designs: 2k-p factorial experiments
11	11	Response surface methodology (RSM)
12	12	Introduction to software MINITAB