DESIGN OF EXPERIMENTS

CourseCode		Year		Semester	
Course Category	HONORS	Branch	ME	Course Type	Theory
Credits	3	L – T – P	3 – 0 – 0	Prerequisites	Statistics
Continuous Internal Evaluation	30	Semester End Evaluation	70	Total Marks	100

Course Outcomes: Upon successful completion of the course, the student will be able to

	Statement	Skill	BTL	Units
CO1	Illustrates fundamentals, methods used for Design of experiments	Understand Communication	L2	1,2,3,4,5
CO2	Discuss experiments for a critical comparison of outputs	Understand Communication	L2	2
CO3	Propose hypothesis from experimental data	Apply, Communication	L3	3,4
CO4	Implement factorial and randomized sampling from experiments, multi-dimensional optimization	Apply, Communication	L3	5

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1				3	2							2		
CO2	3	3		3							2			
CO3	3			3	2							2		2
CO4				3	2							2		2

Syllabus

UNIT	Contents	Mapped COs
I	Introduction: Strategy of experimentation, basic principles, guidelines for designing experiments. Simple Comparative Experiments: Basic statistical concepts, sampling and sampling distribution, inferences about the differences in means: Hypothesis testing, Choice of samples size, Confidence intervals, Randomized and paired comparison design.	CO1
II	Experiments with Single Factor: An example, The analysis of variance, Analysis of the fixed effect model, Model adequacy checking, Practical interpretation of results, Sample computer output, Determining sample size, Discovering dispersion effect, The regression approach to the analysis of variance, Nonparametric methods in the analysis of variance, Problems.	CO1, CO2
III	Design of Experiments: Introduction, Basic principles: Randomization, Replication, Blocking, Degrees of freedom, Confounding, Design resolution, Metrology considerations for industrial designed experiments, Selection of quality characteristics for industrial experiments, Parameter	CO1, CO3

	Estimation.	
IV	Response Surface Methods: Introduction, The methods of steepest ascent, Analysis of a second-order response surface, Experimental designs for fitting response surfaces: Designs for fitting the first-order model, Designs for fitting the second-order model, Blocking in response surface designs, Computer-generated (Optimal) designs, Mixture experiments, Evolutionary operation, Robust design, Problems.	**CO1, CO3**
V	Design and Analysis: Introduction, Preliminary examination of subject of research, Screening experiments: Preliminary ranking of the factors, active screening experiment-method of random balance, active screening experiment Plackett-Burman designs, Completely randomized block design, Latin squares, Graeco-Latin Square, Youdens Squares, Basic experiment-mathematical modeling, Statistical Analysis, Experimental optimization of research subject: Problem of optimization, Gradient optimization methods, Nongradient methods of optimization, Simplex sum rotatable design, Canonical analysis of the response surface, Examples of complex optimizations.	**CO1, CO4**

Learning Resources
Text books
1.Lazic Z. R., Design of Experiments in Chemical Engineering, A Practical Guide, Wiley, 2005. 2.Antony J., Design of Experiments for Engineers and Scientists, Butterworth Heinemann, 2004.
Reference books
1.Montgomery D. C., Design and Analysis of Experiments, Wiley, 5th Edition, 2010. 2.Doebelin E. O., Engineering Experimentation: Planning, Execution, Reporting, McGraw-Hill, 1995.