GUJARAT TECHNOLOGICAL UNIVERSITY

Master of Engineering
Subject Code: 3732806
Semester – III
Subject Name: Design of Experiments

Type of course: Program Elective V

Prerequisite: Nil

Rationale:
This course provides the knowledge of Various Techniques used in Experimental Works. This course gives hands on practice regarding Hybrid Designing tools using to solve or Trial and errors for Research work for Optimization. This course gives knowledge about different major industrial application related to modernize Production.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	0	3	70	30	0	0	100

Content:

Sr. No.	Content	Total Hrs
1	**Random Variables:** Introduction to discrete and continuous random variables, quantify spread and central tendencies of discrete and continuous random variables **Important Statistical Distributions:** Properties and applications of Normal, log-normal and t-distributions, Chi-Square and F distributions	04
2	**Point and interval estimates of population parameters:** Point Estimation of the population mean, distribution of the sample means, central Limit theorem, confidence Intervals on the population mean, optimal sample size to obtain precision and confidence in interval estimates of mean, maximum likelihood parameter estimation	08
3	**Hypothesis Testing:** Formulation of null and alternate hypotheses, errors in hypothesis Tests, power of hypothesis tests, hypothesis tests on population means, variances and ratios of variances	08
4	**Analyze single factor experiments:** Introduction to Analysis of Variance (ANOVA), blocking and randomization	06
5	**Factorial Design of Experiments:** Need for planned experimentation, factorial design experiments involving two factors, effect of interactions, ANOVA in factorial design, general factorial design, partial factorial designs.	06

	Use descriptive statistics and charts to summarize cross-sectional and time series data.	
6	**Linear Regression Analysis:** Matrix approach to linear regression, Variance-Covariance matrix, ANOVA in regression analysis, quantifying regression fits of experimental data, Extra sum of squares approach, confidence intervals on regression coefficients, lack of fit analysis.	05
7	**Comparison of different experimental design strategies:** Properties of orthogonal designs, implications of different factorial design models, importance of center runs, scaled prediction variance, central composite design, Box-Behnken design, moments of experimental designs, rotatable of experimental designs, face centered cuboidal designs, comparison of experimental designs	04
8	**Response Surface Methodology:** Method of steepest ascent, first and second order models, identification of optimal process conditions	04
	Total Hours	**45**

Suggested Specification table with Marks (Theory): (For BE only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	**10**	**30**	**20**	**20**	**10**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. H. Toutenburg and Shalabh: Statistical Analysis of designed experiments, Springer 2009
2. D. C. Montagomery: Design & Analysis of Experiments, 5th Edition, Wiley, 2001

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Able to understand statistical process and different variables	30
CO-2	Able to solve the problems in analytical way.	40
CO-3	Able to optimize the existing process parameters by applying different techniques.	30

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Term Work: Nil

List of Experiments: Nil

Major Equipment: Nil

List of Open Source Software/learning website:

1. The concerned faculty member shall provide the list of peer reviewed Journals and Tier-I and Tier-II Conferences relating to the subject (or relating to the area of thesis for seminar) to the students in the beginning of the semester.
2. NPTEL