SARDAR PATEL UNIVERSITY
Vallabh Vidyanagar, Gujarat
(Reaccredited with 'A' Grade by NAAC (CGPA 3.25)
Syllabus with effect from the Academic Year 2021-2022

(Mater of Science in Statistics) (Master of Science)
(M. Sc.) (Statistics) Semester (II)

Course Code	PS02CSTA52	Title of the Course	LINEAR MODELS AND REGRESSION ANALYSIS
Total Credits of the Course	04	Hours per Week	04

Course Objectives:	1. To understand ingredient of linear models and regression analysis. 2. To gain insight of estimation and testing procedure of linear models for full rank and non full rank data matrix 3. To learn fix effect model and random effect model and Analysis of Covariance model as an application of linear model

Course Content		
Unit	Description	Weightage* (%)
1.	Introduction of models based on nature of data; need of estimation of linear parametric functions; Gauss-Markov set-up, Normal Equations and Least Square Estimators, Error and estimation spaces, variances and covariance of least square estimators, estimation of error variance, Distribution of sums of squares due to regression and errors.	25
2.	Least square with correlated observations, least square estimators with restriction on parameters, simultaneous estimators of linear parametric functions. Tests of hypotheses for one and more than one linear parametric functions, confidence intervals and regions, Analysis of Variance, Analysis of Covariance. Multiple comparison tests due to Tukey and Scheffe, simultaneous estimation of linear parametric functions.	25
3.	Introduction to one-way random effects linear models and estimation variance components. Multiple Linear Regression, polynomial regression and use of orthogonal polynomials. Measures of goodness-of-fit .	25
4.	Regression model building – best subset selection, stepwise regression, residual analysis. Model selection criteria - R Square, Adjusted R	25

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	square, AIC, BIC, Mallow's C_p Statistic. Multicolinearity: Introduction, Reasons, detection and remedies, Ridge regression.

Teaching-Learning Methodology	Discussion and question answers based learning Black board/Multimedia projector using ICT Tools Learning through Problem solving approach Assignments and seminars are given for development of confidence among students Fitting of regression models to data using software (demonstration of software R language for data handling)

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Distinguish between General Linear Models and Regression Analysis
2.	Estimate parameters of General Linear Model using least square method under various conditions on data matrix, conditions on parameters and testing of hypothesis about parameters
3.	Derive the distributions of sum of squares due to regressors, errors for ANOVA and ANCOVA model
4.	Fit simple and multiple linear regression to data with step by step procedure

Suggested References:

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Sr. No.	References
1.	Weisberg, S. (2005). Residual and Influence in Regression. Wiley Series in Probability and Statistics, Wiley
2.	Draper, N. R. and Smith, H. (1998).Applied Regression Analysis. Third Edition, Wiley India Ltd.
3.	Gunst, R. F. and Mason, R. L. (1980). Regression Analysis and its Applications –A Data Oriented Approach. Macel and Dekker.
4.	Rao, C. R. (2001) Linear Statistical Inference and its Applications. Ed. II, Wiley Eastern.
5.	Weisberg's. (1985). Applied Linear Regression. Wiley Series in Probability and Statistics, Wiley
6.	Gujarathi, D. N. and Sangeetha (2007). Basic Econometrics, Ed. IV , Tata MacGraw Hill
7.	Montgomery, D. C., Peck, E. A and Vinning, G. G. (2010). Introduction to Linear Regression Analysis, Ed.III, Wiley
8.	Freund, J. R, Wilson, W.J, and Sa, P. (2006). Regression Analysis: Statistical Modeling of Response Variable, Ed.II, Academic Press
9.	Kshirsagar, A.(1983). A Course in Linear Models, Statistics : Textbook and Monographs, Vol. 45, Marcel Dekker, Inc.
10.	Hey-Jahans, C.(2012) .An R Companion to Linear Statistical Models ,CRC Press

On-line resources to be used if available as reference material
On-line Resources

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