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

MASTER OF SCIENCE IN APPLIED STATISTICS
M. Sc. Applied Statistics, Semester – II

Course Code	PS02CAST52	Title of the Course	LINEAR MODELS AND REGRESSION ANALYSIS
Total Credits of the Course	04	Hours per Week	04

Course Objectives:	To understand ingredient of linear models and regression analysis.
	To gain insight of estimation and testing procedure of linear models for full rank and non full rank data matrix
	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; preliminary of matrix algebra; need of estimation of linear parametric functions; Gauss-Markov set-up, Normal Equations and Least Square Estimates, Error and estimation spaces, variances and covariance of least square estimates, estimation of error variance, Distribution of sum of square due to regressors, errors.	25
2.	Least square with correlated observations, least square estimates with restriction on parameters, simultaneous estimates of linear parametric functions. Tests of hypotheses for one and more than one linear parametric functions, confidence intervals and regions, Analysis of Variance, Power of F-test, Analysis of Covariance Model Multiple comparison tests due to Tukey and Schéffé, simultaneous estimates of linear parametric functions	25
3.	Introduction to one-way random effects linear models and estimation variance components. Simple Linear Regression; Estimation and testing of parameters, confidence intervals, application , Lack of fit tests Multiple Linear Regression: Introduction, estimation and testing of	25

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	parameters, goodness of fit criteria; R Square, Adjusted R square, AIC,BIC	
4.	Residual and their plots as test for departure from assumptions such as fitness of the model, normality, homogeneity of variances and detection of outliers, Remedies. Multicollinearity: Introduction, Reasons, detection and remedies, Ridge regression and principle component regression, subset selection of explanatory variables, Mallow's C_p Statistic.	25

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

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	ANCOVA model
4.	fit simple and multiple linear regression to data with step by step procedure

Suggested References:	
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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