SARDAR PATEL UNIVERSITY
Programme & Subject: M.Sc (Statistics)
Semester: III
Syllabus with Effect from: June-2013

Paper Code: PS03ESTA03	**Total Credit: 4**
Title Of Paper: Generalized Linear Models	

Unit	Description in Detail	Weightage (%)
I	Review of Linear Statistical Models, Discrete Response Data, Introduction of Generalized Linear Models (GLMs), Components: Linear Predictor, Link Function, Natural Parameters, Scale Parameters; Exponential Family of Distributions (EFD): Members of EFD: Normal, Lognormal, Exponential, Gamma, Binomial, Poisson, Negative Binomial; Steps for Model Fitting, Mean and Variance of EFD; Frequent Inference: Estimation of Parameters through Iteratively Reweighted Least Square (IRLS) and Algorithms, Form of Adjacent Dependent Variable and Weights, Analysis of Deviance, Nested Model and Non-Nested Model; Goodness of Fit Criteria: RSquare, Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC), Bayesian Information Criterion (BIC); Step Wise Selection; Testing of Parameters through Wald Test; Confidence Intervals; GLMs Residuals: Residual Analysis, Pearson Residual, Anscombe Residual, Deviance Residual. Model Checking: Hat Matrix, Outlier, Leverage, Influence.	25%
II	Binary Data: Models for Binary Data: Group Data and Ungroup Data, Linear Predictor, Link Function: Logit, Probit and Complementary Log Log; Prospective Study and Retrospective Study, Likelihood Function, Estimation of Parameters through IRLS Method; Deviance; Probit Model, Residual Analysis Polytomous Data: Introduction of Multinomial Logistic Regression and Ordinal Regression, Examples and their inference. Ordinal Regression Models with Qualitative or/and Quantitative Covariates; Parallel Line Regression.	25%
III	Count Data: Introduction Poisson Regression, Likelihood, Estimation and Testing of Parameters: Log Linear Model for Contingency Table and their Analysis Generalized Linear Models with distribution having Constant Coefficient of Variation; Gamma Family; Canonical Link Function; Inference and Residual Analysis of GLMs with Gamma Distribution; Comparison between Response having Gamma distribution and lognormal distribution; Examples and Applications.	25%
IV	Models for Survival Data: Estimation with Censored Survival Data and Survival Distribution: Exponential Distribution; Weibull Distribution and their Examples. Under and Over Dispersion Problem of Data, Quasi Likelihood for Estimation of Parameters, Properties of Quasi Likelihood, Analysis of Deviance; Quasi Likelihood: Binomial, Poisson, Normal, Gamma, Lognormal, Exponential; Comparison of Quasi Likelihood with Likelihood; Concept of Marginal Likelihood, Conditional Likelihood; Models with Nonlinear Parameters in Covariates; Model Checking: Checking Link Function, Checking Covariance Scale, Checking the Variance Function, Score Test for Extra Parameters, Checking Form of Covariates, Detection of Influential Observations.	25%

Basic Text & Reference Books:-

- Agresti, A. (2002). Categorical Data Analysis, ED.II, Wiley InterScience
- Fahrmier,L .and Tutz,G.(2001). Multivariate Statistical Modelling Based on Generalizes Linear Models, Springer
- Gill, J.(2001).Generalized Linear Models: A Unified Approach, Sage Publication
- Lindsey, J.K. (1997). Applying Generalized Linear Models , Springer
- Maindonald,J. And Braun,J. (2007). Data Analysis and Graphics using R: An example based approach Ed.II, Cambridge University Press
- McCullagh, P. And Nelder,J.A. (1983). Generalized Linear Models- Monographs on Statistics and Applied Probability, Chapman and Hall
- Myers, R.H, Montegomery, D.C., Vinning, G.G and Robinson, T.J.(2010). Generalized Linear Models with Applications in Engineering and the Sciences, Ed.II , Wiley Series in Probability and Statistics, A John Wiley & Sons.