SARDAR PATEL UNIVERSITY
VALLABH VIDYANAGAR

SYLLABUS EFFECTIVE FROM: 2018-19
MASTER OF SCIENCE (APPLIED STATISTICS)
Syllabus for M.Sc. (Applied Statistics)
Semester – IV

PS04CAST21: COMPUTER ORIENTED STATISTICAL METHODS

Unit 1   Generation of random numbers from UNIFORM, BINOMOIAL, POISSON, EXPONENTIAL, WEIBULL, NORMAL, GAMMA, t, F, MULTIVARIATE NORMAL DISTRIBUTION and different Stochastic Processes using pseudo random number generation algorithms like linear congruential method (LCG), Inverse method, rejection method etc.   12 L

Unit 2   **Simulation Principles:** Rejection method; variance reduction; importance sampling. Simulation of probability distribution of different statistics using Monte Carlo and similar techniques. Estimation of Bias, MSE and other statistics using bootstrap and similar techniques. **MCMC algorithms:** Metropolis-Hastings algorithm; Gibbs sampling   12L

Unit 3   Logistic Regression Models: Introduction; The multiple logistic regression model; Fitting the logistic regression model; testing for the significance of the model. Application of logistic regression in study of Matched case control data.
Cox's regression model: Proportional Hazard Model. Estimation and tests of parameters of the proportional hazard model. Use of this in comparison of two more life distributions.
Discriminant Analysis: 12L

Unit 4   Multivariate techniques: (i) Principal component analysis (ii) FactorAnalysis (iii) Canonical Correlation (iv) Cluster Analysis.   12L

Books Recommended

1   Fishman, G.S. (1996) Monte Carlo: Concepts, Algorithms, and Applications.(Springer).

2   Rubinstein, R.Y. (1981); Simulation and the Monte Carlo Method. (Wiley).

3   Tanner, M.A. (1996); Tools for Statistical Inference, Third edition. (Springer.)

4   Efron, B. and Tibshirani. R.J. (1993); An Introduction to the Bootstrap. (Chapman and Hall).

5   Shao J. and Tu, D. (1995); The Jackknife and the Bootstrap. Springer Verlag.

6   McLachlan, G.J. and Krishnan, T. (1997) The EM Algorithms and

Extensions.(Wiley.)
7   Simonoff J.S. (1996) Smoothing Methods in Statistics. (Springer).
8   William J., Kennedy, Jr. James E. Gentle (1980). Statistical Computing.
     Marcel Decker
9   J.S. Liu (2001). Monte Carlo Strategies in Scientific Computing,
     Springer,
10   Kshirsagar, A. M. (1972). Multivariate Analysis, Marcel Dekker, NY

PS04EAST21: CLINICAL TRIALS

Unit 1   Introduction to clinical trials, the need, ethics, protocol of clinical trials,   12 L
         Overview of phase 1 – IV and DF, SE, CTE trials, data management
         and case studies. bias and random error in clinical studies, Endpoints
         of clinical trials and sample size estimation in SE and CTE trials.

Unit 2   Design of clinical trials parallel vs. cross over designs, cross sectional   12L
         vs. longitudinal designs, review of factorial designs. Randomization
         techniques for group allocation.

Unit 3   Analysis of outcomes from Phase I- III trials, analysis of survival data   12L
         from clinical trials, techniques for Interim analysis, intent to treat
         analysis.

Unit 4   Application areas Meta analysis, Multi-center trials, Bioequivalence   12L
         trials

Books Recommended
     1   David Machin, Simon Day. Text Book Of Clinical Trials
     2   Ton Cleophs, Aeilko Zwinderman. Statistics Applied To Clinical Trials.
     3   Stephen Senn. Cross – Over Trials In Clinical Research.
     4   Annpey Pong & Shein- Chung Chow. Hand Book Of Adaptive Designs
          In Pharmaceutical And Clinical Development
     5   Effron and Marubini. Analyzing data from CT and Obs studies
     6   Karl E. Peace. Design And Analysis Of Clinical Trials With Time-To-
          Event Endpoints
     7   Geert Molenberghs & Michael G. Kenward. Missing Data In Clinical
          Studies
     8   Annpey Pong , Shein- Chung Chow. Handbook Of Adaptive Designs In
          Pharmaceutical And Clinical Development
     9   Shein-Chung Chow, Mark Chang. Adaptive Design Methods In Clinical
          Trials.
     10   Umakanta Sahoo, Dipti Sawant. Clinical Trial Monitoring A Professional
          Hand Book
     11   Diane Fairclough. Design And Analysis Of Quality Of Life Studies In
          Clinical Trials.

PS04EAST22: ECONOMETRICS

Unit 1	Econometrics: Definition, Methodology, Examples, Nature and Source of Data, Classical Linear Regression Model (CLRM): Assumptions, estimation of parameters through Maximum Likelihood Method and Ordinary Least Square Method, Properties of Estimator, Model Selection Criterion; RSquare, Adjusted RSquare, Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC) Mallow's C_p Criterion, Forecast Chi-Square, Significance Test and Confidence Interval, Testing of Subset of Regressors, Point Predictor, Cobb-Douglas Production function, Constraint Least Square, Dummy Variable: Nature, introduction, examples, Chow Test, Seasonal Adjustment	12 L
Unit 2	Hetroscedasticity: Reason of Hetroscedasticity; Detection: Informal Method, Formal Test; Park Test, Goldfield-Quant Test, White General Hetroscedasticity Test, The Breusch-Pagan Test; Remedial Measures, OLS Assumptions in presence of Hetroscedasticity; Method of Generalized Least Squares (GLS), Consequences of using OLS in presence of Hetroscedasticity; Autocorrelation: Nature of the Problem, OLS Estimation in the presence of Autocorrelation, Consequences of Autocorrelation, Detection: Graphical Method, The Run Test, Durbin-Watson d Test, A General Test of Autocorrelation, The Breusch-Goldfrey (BG) Test; GLS when correlation coefficient is known as well as unknown; Auto Regressive Conditional Hetroscedasticity (ARCH) and Generalized Autoregressive Conditional Hetroscedasticity (GARH) Model; Analysis of Residuals: Outliers, Leverage, Influence; Chow Prediction Failure Test	12L
Unit 3	Multicolinearity Problem, Its implications and tools for handling the problem; Detection of Multicolinearity; Remedial Measures; Ridge Regression; Use of Principle Component Analysis; Linear Regression with Stochastic Regressors, Types of Specification Errors, Errors of Measurement, Instrumental (Proxy) Variable	12L
Unit 4	Simultaneous Equation Models: Nature, Examples, Identification Problems: Rules of Identification: The Order Condition of Identifiablity, The Rank Condition of Identifiability. Estimation in Simultaneous Equation Models, Recursive System, Indirect Least Square (ILS) Method, Two Stage Least Square Method (2SLS)	12L

Books Recommended:
1   Doran, H.E.(1989). Applied Regression Analysis in Econometrics, Marcel Dekker Inc.
2   Freud, R.J., Wilson,W.J. and Sa,P.(2006). Regression Analysis: Statistical Modeling of a Response Variable, Ed. II Elsevier Inc.
3   Gujarathi, D.N. and Sangeetha (2007). Basic Econometrics, Ed. IV , Tata MacGraw Hill
4   Greene, W.G. (2003) Econometric Analysis. Ed. V, Pearson Education
5   Intriligator,M.D., Bodkin, R.G., Hsiao, C.(1996). Econometric Models, Techniques and Applications, Pearson Publisher
6   Johnston, J. (1984) : Econometric methods, Third edition, McGraw Hill.
7   Ruppert, D.(2004). Statistics and Finance: An Introduction , Springer (India) Pvt. Ltd.
8   Theil, H. (1982) : Introduction to the theory and practice of Econometrics, John Wiley.
9   Walters, A (1970) : An introduction to Econometrics, McMillan & Co
10   Wasington, S.P., Karlftis, M.G. and Mannering, F.L. (2011). Statistical and Econometric Methods for Transportation Data Analysis, Ed. II, CRC Press, Chapman & Hall Books

PS04CAST23: PROJECT (12 Credits)

The students are supposed to undertake 12 credits project work in the field to learn practical aspects of the theory. For this purpose, they are supposed approach the industries/corporate and choose problems related to courses they have studied. The students are supposed to submit project report under the guidance of both internal and external guides.