VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

M.Sc.: APPLIED STATISTICS

Effective From: 2010 – 2011

1. **Fee structure** **:-** Self-Finance Course
   Rs. 10000/- per semester + university fees

2. Eligibility for Admission:

- A student having statistics / mathematics / quantitative techniques / econometrics / research methodology at under graduate or post graduate level as principal / subsidiary subjects and has secured at least II class will be eligible for admission to this course
- Any graduate with three subjects with one of them should be statistics / mathematics and has secured at least II class will be eligible for admission to this course.

3. Passing standard in this course; as per prevailing rules sanctioned by the University.

VEER NARMAD SOUTH GUJARAT UNIVERSITY
University Campus, Udhana-Magdalla Road,
Surat - 395 007.

M.Sc.: APPLIED STATISTICS

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SEMESTER – I

Paper No.	Title of the Paper	Marks			Work Load (hrs /week)	
		Int.			L	T
MAS-101	Basic Mathematics and Elements of Probability Theory	30	70	100	3	1
MAS-102	Probability Distributions	30	70	100	3	1
MAS-103	Sampling Techniques	30	70	100	3	1
MAS-104	Industrial Statistics	30	70	100	3	1
MAS-105	Introduction to Ms-Office and Internet	30	70	100	3	1
MAS-106	Practical paper-I based on Paper - 101, 102,103	50	100	150	15 hrs	
MAS-107	Practical paper-II based on Paper - 104, 105	30	70	100		
Viva-Voce		30	70	100		
Total		260	590	850	15	05
Total workload per week					35	

SEMESTER – II

Paper No.	Title of the Paper	Marks			Work Load (hrs /week)	
		Int.	Ext.	Total	L	T
MAS-201	Statistical Inference -I	30	70	100	3	1
MAS-202	Statistical Inference -II	30	70	100	3	1
MAS-203	Multivariate Analysis	30	70	100	3	1
MAS-204	Population Studies	30	70	100	3	1
MAS-205	Computer Programming Language - "C"	30	70	100	3	1
MAS-206	Practical paper-III based on Paper - 201, 202, 203	50	100	150	15 hrs	
MAS-207	Practicals based on Paper - 204, 205	30	70	100		
Viva-Voce		30	70	100		
Total		260	590	850	15	05
Total workload per week					35	

M.Sc. : APPLIED STATISTICS

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SEMESTER - III

Paper No.	Title of the Paper	Marks			Work Load (hrs /week)	
		Int.			L	T
MAS-301	Statistics for Economics	30	70	100	3	1
MAS-302	Operations Research - I	30	70	100	3	1
MAS-303	Database Management System	30	70	100	3	1
MAS-304	Design of Experiments	30	70	100	3	1
MAS-305	Introduction to Statistical Softwares	30	70	100	3	1
MAS-306	Practicals based on Paper - 301,302,303	50	100	150	15 hrs	
MAS-307	Practicals based on Paper - 304, 305	30	70	100		
Viva-Voce		30	70	100		
Total		260	590	850	15	05
Total workload per week						35

SEMESTER – IV

Paper No.	Title of the Paper	Marks			Work Load (hrs /week)	
		Int.	Ext.	Total	L	T
MAS-401	Econometrics	30	70	100	3	1
MAS-402	Operations Research - II	30	70	100	3	1
MAS-403	Data Mining	30	70	100	3	1
MAS-404	Practicals based on Paper - 401, 402,403	50	100	150	9 hrs	
*	Project and Seminar	200	-	200	3 hrs	
Viva		30	70	100		
Project Viva		100		100		
Total		470	380	850	09	03
Total workload per week						24

* To be done at some industry / firm / organization.

Grand Total: 3400 Marks

SEMESTER- I

PAPER: MAS-101

BASIC MATHEMATICS AND ELEMENTS OF PROBABILITY THEORY

1. Concepts of Function, Algebra of functions, Algebra of functions Polynomial and Exponential functions &Logarithmic functions.
2. **Permutations and Combinations**
3. **Determinants, Matrices, Algebra of matrices:** Determinants & its properties. Scalar multiplication, addition and multiplication of matrices. Inverse of a square matrix. Concept of rank of a matrix. Rank determination. Linear equations, Systems of linear equations as matrix equations. Characteristic roots and vectors.
4. Sums of some standard series of positive terms.
5. Concept of Derivative of a function. Derivatives of x^n, e^X, logx. Algebra of differentiation. Interpretation of derivative as rate of change & Applications.
6. Integration as an inverse operation of differentiation. Definite Integral. Integral as the area under a curve. Properties of Integral. Integrals of some standard functions & its Applications.
7. **Numerical Methods:** Solution of algebraic and transcendental equations, Numerical integration, Concept of interpolation, Simpson 1/3 rule & 3/8 rule & its Applications.
8. **Probability:** Sample space of a chance experiment, Elementary outcomes, Events, Representation of events as sets, Combination of events (Complements, Intersections, Unions). Probability functions over a sample space (Discrete case). Case of Equally likely, elementary outcomes: Laplace definition of probability of an event, Axioms of probability. Combinatorial problems of Probability calculation. Conditional Probability. Bayes Theorem. Independent events.

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MAS - 102

Probability Distribution

1. Random Variables & their Distributions :

Definition of random variable, Discrete and continuous random variable. Probability distribution of a random variable. Concept of Probability mass function and Probability density function, Distribution Function (d.f.) of a random variable, Bivariate Distribution, Conditional distributions, Multivariate distributions

2. Frequency Distributions :

Frequency distribution of a discrete and continuous random variable (Grouping of data in terms of class intervals). Mean, variance and Moments of a frequency distribution. Bivariate frequency distribution.

3. Expectations & Moments of a Distribution :

Expectation of a random variable & a function of a random variable (Discrete and Continuous case). Moments, Mean, Variance, Standard deviation, Skewness and Kurtosis of a random variable (distribution). Independence of variables. Linear transformation of variable, Moments under linear transformation, Problems on calculation of mean, variance, S.D. and other moments of a distribution.

4. **Some Common Discrete Distributions: (proofs for p.d.f., mean & variance only):**

Bernoulli distribution, Binomial distribution, Poisson distribution, Hyper-geometric distribution, Negative Binomial distribution, Geometric distribution.

General concept of m.g.f. & other important properties of distributions (without proof)

5. **Some Common Continuous Distributions: (proofs for p.d.f., mean & variance only):** Uniform distribution, Normal distribution, Exponential distribution, Beta and Gamma distribution. General concept of m.g.f. & other important properties of distributions (without proof)
6. **Sampling Distributions:** χ^2 - distribution, t – distribution, F – distribution, Distribution of $\bar{x}$ and S^2 for Normal distribution.

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1. Mood A. M., Graybill F. A. and Boes D. C. (2001): "An Introduction to Theory of Statistics"; McGraw Hill and Tata McGraw Hill. ISBN: 100070445206, ISBN-13: 9780070445208
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PAPER - 103
SAMPLING TECHNIQUES

1. **Planning and Execution of Surveys :**
   Concept of population, sample, Advantages of sample survey, Principal steps in a sample survey and Determination of sample size, Pilot surveys, selection of enumerators, training of enumerators, supervision of enumerators, control of quality of field work, observation, reinterviews, field edit, follow-up of nonresponse, interpenetrating sub samples, time coding, tabulation, control of data processing, use of computers, report writing, general report, technical report.

2. **Simple random sampling:**
   Selection of sample, Estimation of population total and means, standard error and coefficient of variation of estimator.

3. Stratified random sampling:

Estimation of mean, variance of the estimator, Estimation of the variance, Estimation of gain due to stratification from a stratified sample: finding sample sizes under proportional and optimum allocations and their comparisons for a given sample.

4. Systematic Sampling :

Estimation of mean, variance of the estimator, Estimation of variance based on interpenetrating sub samples, Comparison of systematic and simple random sampling for a given population.

5. Two stage sampling :

Estimation of the population mean, variance of the estimator and Estimation of the variance for first stage units of equal sizes, finding optimum values of first and second stage sample sizes for a given simple cost function.

6. Cluster sampling :

Meaning and need, Estimation of population mean per unit, variance of estimator. Estimation of this variance. Variance in terms of intra class correlation coefficient as its comparison with unistage mean per unit estimator, when clusters are of equal selection, nationwide surveys, Design of nationwide sample surveys.

7. Ratio, Product and Regression methods of Estimation :

Finding the estimates and their standard errors from given data, comparison of their performance.

8. Data Collection in Selected Fields :

Surveys of agricultural area, surveys of agricultural production, demographic surveys, employment and unemployment surveys, consumer expenditure surveys, surveys of health, industrial surveys, surveys of distributive trade, sampling as an census surveys of road traffic, public opinion surveys, marketing research, payroll surveys, postal traffic surveys, sociological research.

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15. Foreman E. K. (01991): Survey sampling principles, Marcel Dekker, ISBN: 0824784073, 9780824784072

PAPER – 104

INDUSTRIAL STATISTICS

Quality Control :

Review of :

Quality and Statistical Quality control concept.
Control Charts for Measurements.
Control Charts for Attributes.
Acceptance sampling Plans for Attributes.

Cusum Charts.
Standard Plans for Attributes.
Plan for Acceptance Sampling by Measurement.
Concept of Total Quality Management (TQM).
- Accelerating use of TQM.
- Service Quality vs Product Quality.

Strategic Quality Planning.
- Strategy and Strategic Planning Process
- Strategic Quality Management

Organizing for TQM
Productivity and Quality
- The Leverage of Productivity
- Quality management Systems vs Technology
- Basic Measures of Productivity

The Cost of Quality.
- Cost of Quality Defined.
- Different views of Quality Costs.
- Quality Costs and its Measurement.

Criteria for Quality Programs.
- ISO 9000 and onwards.
- Concept of six sigma limits.

Reliability :

Basic concepts and distributions for product life, failure rate. Hazard function, Reliability function for Exponential, Normal, Log-normal, Weibull and Gamma Distributions. Analysis of Complete Data. Linear analysis and maximum likelihood analysis of censored data for exponential distribution only. Introduction of Bayes Methods in Reliability. Accelerated life testing. System reliability.

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PAPER - 105

INTRODUCTION TO MS-OFFICE AND INTERNET

1. WINWORD
   - 1.1 Typing, Editing, Proofing & Reviewing
   - 1.2 Formatting Text & Paragraphs
   - 1.3 Automatic Formatting and Styles
   - 1.4 Working with Tables
   - 1.5 Graphics and Frames
   - 1.6 Mail Merge

1.7 Automating Your Work & Printing Documents

2. EXCEL

2.1 Working & Editing in Workbooks
2.2 Creating Formats & Links
2.3 Formatting a Worksheet & Creating Graphic Objects
2.4 Creating Charts (Graphs), formatting and analyzing data
2.5 Organizing Data in a List (Data Management)
2.6 Sharing & Importing Data
2.7 Printing

3. POWER POINT PRESENTATION

3.1 Preparation of Slides,
3.2 Inserting Elements into Slides,
3.3 Inserting Animation
3.4 Preparing Slideshows.

4. Introduction to Internet

5.1 Internet Protocols
http, ftp, TCP/IP, etc.
5.2 Internet Utilities
e-mail, chat, searching, etc.

6. Web Browsers
7. Web Server
8. HTML

8.1 HTML Tags

9. Dreamweaver

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SEMESTER - II

PAPER – 201

STATISTICAL INFERENCE - I

Estimation :

Theoretical finite and infinite population, parameter, statistic, estimation of a parameter, Problem of Criterion of selecting a good estimator, Unbiasedness, Consistency, Efficiency and Sufficiency. Introduction of order statistics (without proof) and parameter exponential family of distribution.

Methods of obtaining estimators:

(i) Method of maximum likelihood (ii) Method of least squares (iii) Method of moments, Method of minimum chi-square, (v) Minimum distance method, Properties of M.L.E. & moment estimators.

Properties of Point estimator:

(i) Closeness (ii) Unbiasedness Estimators (iii) consistency (BAN or CAN Estimators)
Sufficiency: Sufficient statistic and jointly sufficient statistic, Factorization theorem, Minimal sufficient statistic, complete sufficient statistic.

Minimum variance unbiased estimation :

UMVUE Lower bound of variance of an estimator. Statements & application of C. R. inequality, Rao-Blackwell theorem, Lehnam-scheffe theorem.

Invariance :

Location and scale invariance. Pitman's estimators for location and scale parameter.

Interval Estimation :

Introduction to confidence interval, Definition of confidence interval, Pivotal quantity, Pivotal quantity method.

(i) Confidence interval for mean and variance when sampling is done from normal population.
(ii) Confidence interval for large samples.

Elementary Decision Theory:

Decision problem, basic components and spaces associated with the decision problem, Decision rules, Risk function, Minimax-decision rule, prior and posterior distribution, Bayes risk, Bayes Rule, Value of information.

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PAPER-202

STATISTICAL INFERENCE - II

Testing of Hypothesis :

Concepts of hypothesis, statistical hypothesis, simple and composite hypothesis, Null and Alternative hypothesis. One sided and two sided hypothesis. Test of hypothesis, critical region or region of rejection, acceptance region. Types of errors. Sizes of the errors, Level of significance, Size of the test, power function of the test, Two-tail and one tail tests, most powerful test, Likelihood Ratio Test & Test of significance as its particular case.

Parametric tests:

i) Large sample test for mean, variance, proportion and correlation
ii) Small sample tests: χ^2, t, F & Z-transformation
iii) ANOVA

Nonparametric tests:

Sign, Median, Run, Mann Whitney, Wilcoxen, K-S tests, K-W.Test,Tests of independence in 2x2, 2xn and nxc contingency tables, Yates correction, conversion of contingency coefficient as function of χ^2 - statistic. Wald's sequential probability ration test, its properties and applications.

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PAPER - 203

MULTIVARIATE ANALYSIS

1. Concept and need of multivariate analysis, Normal distribution - Some important properties, Concept of Hoteling T^2 distribution (without derivation) & its applications.
2. Comparisons of several multivariate means, multivariable analysis of variances.
3. Classical linear regression model, least square estimation, inference from estimated linear regression model. Multivariate multiple regression. Comparison of two formulation of the regression models. Multiple Regression model with time dependent errors.
4. Concept and application of (i) Factor analysis (ii) Principal Component analysis and (iii) Canonical Correlation analysis.

5. Discrimination and classification : Separation and classification of populations, classification of multivariate populations. Fisher's discrement function, Classification of several populations. Fisher's method of discrimenting among several populations.
6. Concept of correspondence analysis and its application.

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PAPER – 204

POPULATION STUDIES

Introduction :

The nature of demography, demographic view of population, techniques of population studies.

Basic demographic measures, sex-ratio, child-women ratio, crude rates, specific rates.

Life Tables :

Concepts of Life Tables, Assumptions related to life tables, The columns of life tables, Complete and Abridged life tables, Construction of life tables.

Mortality :

Infant Mortality, Neonatal mortality, Perinatal mortality, Maternal mortality, death rates, standardized death rates.

Fertility and Reproduction :

Crude Birth Rate (CBR), General fertility rate (GFR), Age specific fertility rate, Total fertility rate (TFR), Gross reproduction rate (GRR), Net reproduction rate (NRR).

Marriage rates, divorce rates, age pattern of marriage, types of migration, migration rates, migrant components, migrant streams, internal migration, international migration.

Growth of Population and Models of Population :

Introduction, Simple Birth and Death Process, Stationary population models, Stable population models, intrinsic rate of growth, intrinsic age distribution, Quasi stability.

Population Estimates and Projections :

Inter - censal and Post - censal estimates, population projections, mathematical methods, component methods, mortality basis for projections, fertility basis for projections, migration basis for projections.

Census and Sample Surveys :

Definition of Census and its features, Organizing the Census, methods of enumeration, Census in India, Indian Census in 1991 and 2001.

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PAPER - 205

COMPUTER PROGRAMMING LANGUAGE – 'C'

1. Introduction
   - 1.1 Algorithms and Flowchart
   - 1.2 Types of Language
   - 1.3 Introduction to C Language

2. C Fundamentals
   - 2.1 Identifiers
   - 2.2 Data Types
   - 2.3 Constants and Variables
   - 2.4 Arrays

3. Operators and Expressions
   - 3.1 Arithmetic Operators
   - 3.2 Unary Operators
   - 3.3 Relations Operators
   - 3.4 Logical Operators
   - 3.5 Assignment Operators
   - 3.6 Conditional Operators
   - 3.7 Library Functions
   - 3.8 Expressions
   - 3.9 Evaluation of Expression

4. Data Input and Output
   - 4.1 Single Character input and output
   - 4.2 The scanf function
   - 4.3 The printf function
   - 4.4 Gets and Puts functions

5. Control Statements
   - 5.1 The While Statement
   - 5.2 do-while statement
   - 5.3 for statement
   - 5.4 if - else statement
   - 5.5 switch statement
   - 5.6 break statement
   - 5.7 continue statement
   - 5.8 goto statement

6. Functions
   - 6.1 Introduction to functions
   - 6.2 Function definition
   - 6.3 Accessing function
   - 6.4 Passing arguments to function
   - 6.5 Recursive function

7. Data Files
8. Arrays
    - 8.1 Defining an array
    - 8.2 Processing an array
    - 8.3 Multi dimensional arrays
    - 8.4 Passing array to a function
    - 8.5 Arrays and Strings

9. Structures and Unions
    - 9.1 Defining a structure
    - 9.2 Processing a structure
    - 9.3 Unions

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SEMESTER - III

PAPER - 301

STATISTICS FOR ECONOMICS

Analysis of Time Series :

Definition and importance of time series analysis. Stationary Time series. Components of a Time series. Different methods for determination of trend, their merits and demerits. Methods for elimination of seasonal components. Determination of cyclic components. Variate difference method.

Box-Jenkins Models, Introduction to Autoregressive (AR) Models, Moving Average (MA) Models, Mixed Autoregressive Moving Average (ARMA) Models, Autoregressive Integreted Moving Average (ARIMA) Models. Properties of these models. Forecasting Techniques.

Index Numbers :

Importance of Index Numbers.

Various Formulae : Ratio of Simple Aggregate, Ratio of Weighted Aggregate, Unweighted average of price relatives.

Choice of base period, Different tests of a good index number, Cost of Living Index Number and Various Official Index Numbers, HDI (Human Development Index)

Demand Analysis :

Concept related to demand and supply, price elasticities of demand and supply, Methods of determining demand and supply curves for cross section data and time series data, Leontief's method, Pigou's Method, Engels Curves, Pareto's Law of Income Distribution.

Input-Output Analysis :

Leontief's Static Model for Inter-industry relations.

Growth Models

Classical and Keyensian simple income determination medels, Concepts of multiplier and accelerator, Hicks-Smauelson's Model, Harrod-Domar and Solow's Growth Models.

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PAPER – 302

OPERATIONS RESEARCH – I

1 Linear Programming:

1.1 Definition of linear programming problem (LPP)

1.2 Formulation of LPP .

1.3 Solution of LPP by Graphical and Simplex Method (including Big-M and Two-phase method)

2 Duality:

2.1 Definition of Dual Problem.
2.2 Rules for converting any Primal into its Dual
2.3 Properties of Duality
2.4 Dual-Simplex Method

3 Transportation and Assignment Problems:

3.1 Definition of Transportation Problem (TP)
3.2 Special structure of TP
3.3 Methods for getting basic feasible solution to TP
3.4 Methods for getting optimum solution to TP
3.5 Unbalanced TP
3.6 Definition of Assignment Problem (AP)
3.7 Algorithm for solving an AP
3.8 Unbalanced AP
3.9 Routing Problem

4 Inventory Management Systems:

4.1 Definition
4.2 Costs involved in Inventory Problems
4.3 Classical EOQ Models without and with shortages
4.4 Multi-item Deterministic Models
4.5 Probabilistic Inventory Models
4.6 Inventory Models with Price Breaks

5. Dynamic Programming

5.1 Introduction
5.2 The recursive Equation Approach
5.3 Characteristics of Dynamic Programming
5.4 Dynamic Programming Algorithm
5.5 Solution of Discrete D.P.P.
5.6 Some APPLICATION
5.7 Solution of L.P.P. By Dynamic Programming

6 Simulation

6.1 Introduction & definitions
6.2 Types of simulation
6.3 Uses & limitation
6.4 Phases of simulation Model
6.5 Even type simulation
6.6 Monte-Carlo Simulation & its applications
6.7 Advantages and Disadvantages

7 Sequencing:

7.1 Definition, Notations and Assumptions
7.2 Solution of sequencing problem.
7.3 Problems with n-jobs and 2-machincs
7.4 Problems with n-jobs and 3-machines
7.5 Problems with 2-jobs and m-machines

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PAPER – 303

DBMS (DATABASE MANAGEMENT SYSTEM)

1. Relational Datatbase Design
   - 1.1 Structure of Relation Database
   - 1.2 Database Manager
   - 1.3 Database Administrator
   - 1.4 Pitfalls in Relational Database Design
   - 1.5 Functional Dependacies
   - 1.6 First, Second & third Normal Form, BCNF
2. R. D. B. M. S. package and its tools
   - 2.1 SQL Commands: SELECT, CREATE TABLE, INSERT, UPDATE, DELETE, ALTER TABLE, DROP TABLE, CREATE SEQUENCE, ALTER SEQUENCE, DROP SEQUENCE, CREATE INDEX, ALTER INDEX, DROP INDEX, ROLLBACK, COMMIT, SAVEPOINT, TRUNCATE, CREATE VIEW, DROP VIEW
   - 2.2 Built-in Functions & group functions
   - 2.3 PL/ SQL: Data type in PL/ SQL, user defined RECORD data type, Control statements (IF, LOOP, WHILE, FOR), cursor, passing parameter to cursor, Implicit Cursor, Exception Handling, Storeed & Local Procedures & Functions, Packages, Triggers

Reference

1. An Introduction to Database System- C. J. Date-Narosa
2. Database System Concepts-Henry F. Korth & Abraham Silberschatz-McGraw-Hill
3. Principles of Database System-J. Ullman-Galgotia Pub.
4. Introduction to database system - Bipin C. Desai - Galgotia pub.
5. Fundamentals of Database System-Elmasri Navathe, Addison Wesley
6. Introduction to Databased Management- Navin Prakash - TMH
7. Oracle PL/SQL Programming-Feuerstein & Pribyl, O'Reilly, Shroff Publishers & Distributors Pvt. Ltd.
8. Manual of RDBMS

PAPER – 304

DESIGN OF EXPERIMENTS

Concept and history of Design of experiments.
The need for Designed experiments.
Elementary ideas of blocking and randomized block design.
Elementary idea of treatment structure and Basic principles of Design of experiments
Concept of complete and incomplete block designs. Completely Randomized Design(CRD), Randomized Block Design(RBD), Latin square design(LSD), their analysis with applications. Missing plot technique for RBD, LSD with their applications.

Analysis of Covariance : Analysis of covariance for CRD, RBD and LSD.
Concept of BIBD and its properties. Intra block analysis of BIBD, Youden square design, Crross over design, construction of BIBD, Missing plot technique for BIBD.

Factorial Experiments : Characterization of experiments, factorial experiments, factorial experiments with factors at two levels, grouping for interaction contrasts, confounding, confounding in more than two blocks, experiments with factors at three levels each, analysis of factorial experiments, split-plot designs.

REFERENCES

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PAPER - 305
INTRODUCTION TO STATISTICAL SOFTWARES

Introduction and use of MATLAB, SYSTAT, SPSS and other such statistical packages for analysis of practical problems.

MATLAB

Introduction :

Introduction to Matlab, variable and array, subarrays, displaying output data, data files operation on array, hierarchy of operation on array, built in function in Matlab

Plotting :

Introduction to plotting, graph window, two dimensional plot, multiple plot, components of graph(legend, title,),graphical image, commet, 3D graph, additional plotting features

Subplots, polar plots,

Branching statement and program design :

The if construct, switch construct, The try-catch construct , relational operators, logic operators, logical functions

Loops :

The while loop, The for loop, The break and continue statements, Nesting loops.

User defined function :

Introduction to Matlab functions, variable passing in Matlab(pass by value), preserving data between calls to functions, sub functions, private function, nested function

SPSS

1.Using SPSS

- Starting SPSS
- Types of Data
- Levels of Measurement
- Missing Values

Important Files // database files

2.Data Manipulation

- Selecting Cases
- Standardizing Data
- Transformation of Data
- Split File
- Variable and Value Labels
- Recode Variables/Visual Binning
- Random Sample of the Data
- Creating a Population Variable
- Multi Response
- Time Saving Features / SPSS MACRO

3. Basic Data Analysis
    - Descriptive Statistics
    - Frequency Tables/Cross Tabs
    - Independent T test
    - Paired T Test
    - One-Way ANOVA
    - Correlation / Regression

4. Interpret the Results
    - Presentation with live data

SYSTAT

Introduction

Preparing data for the package

Invoking, Using Date Editor, Reading ASCII Files, Transforming Data, Selecting Subset of Cases, Other Windows.

Procedure Statistics for Data Analysis :

Frequency, Comparing Means, Crosstabs, ANOVA, Correlation, Linear Regression

REFERENCES

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SEMESTER - IV

PAPER - 401
ECONOMETRICS

1. Introduction to Econometrics and Methodology of an Econometrics study.
2. Multivariate Linear regression model : Three variable case :

Introduction to OLS estimation, Coefficient of multiple correlation, Interpretation of regression coefficients, Partial correlation coefficients.

3. Multivariate Linear regression model: The general Model.
   The General form of model, Gauss-Markoff Theorem, OLS estimators and their properties, Coefficient of determination, Normality assumptions about error term, Statistical inference under normality assumption.
4. Multicolinearity :
   Introduction, Three variable cases, General case, Perfect and imperfect (near) multicolinearity, Tests for detecting the presence of multicolinearity, Methods for handling multicolinearity.
5. General Linear Model:
   General form of the model with assumptions and their implication.
   Estimation of Parameters (Aitken estimator), Scalar Predictor (Goldberger Predictor)
   Particular Cases: (a) Heteroschedasticity (b) Autocorrelation.
6. Hetroscedasticity:
   The problem of hetroscedasticity, Consequence of hetroscedasticity, Tests for detecting the presence and nature of hetroscedasticity, Methods for handling hetroscedasticity.
7. Autocorrelation:
   The problem of autocorrelation, Consequences of applying OLS method when here is autocorrelation, Tests for detecting presence of autocorrelation, Estimation of parameters when autocorrelation exists.
8. Simultaneous equations models:
   Introduction and need for simultaneous equations models, General form and reduced form equations, Problem of identification, Conditions for identification, Methods of estimation, Indirect Least Square method and Two-stage Least Square (2-SLS) method.

REFERENCES

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PAPER – 402

OPERATIONS RESERACH - II

1. Sensitivity Analysis:
   - 1.1 Basic concepts
   - 1.2 Changes in the coefficient of objective function
   - 1.3 Changes in the components of vector b and of Matrix A
   - 1.4 Addition / Deletion of variable in the problem
   - 1.5 Addition / Deletion of constraint in the problem

2. Integer Programming:
   - 2.1 Introduction
   - 2.2 All and mixed integer programming (IPP) problems
   - 2.3 Gomory's al1-IPP algorithm
   - 2.4 The branch and bound technique
   - 2.5 Zero - one programming

3. Replacement Theory:
   - 3.1 Types of Replacement Problem
   - 3.2 Replacement of Items that Deteriorate
   - 3.3 Replacement of Items that fails completely and that of Staff

4. PERT / CPM:
   - 4.1 Basic concepts.
   - 4.2 Construction and Time Calculation of the Network
   - 4.3 Determination of Float and of the Critical Path
   - 4.4 Crashing a Project
   - 4.5 Scheduling a Project
   - 4.6 Resource Analysis and Allocation
   - 4.7 Application of PERT/ CPM

5. Goal Programming:
   - 5.1 Definitions and Concepts
   - 5.2 Formulation of Goal Programming Problem (GPP)
   - 5.3 Solution of GPP by Graphical and Extended Simplex Methods

REFERENCES

1. K. Swarup, Gupta P.K. and Man Mohan(2008): "Operations Research"; S.Chand & Co., New Delhi, **ISBN:** 8180545350, **ISBN-13:** 9788180545351
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PAPER - 403
DATA MINING

1. Introduction to Data Mining
    - 1.1 What is Data Mining
    - 1.2 Applications of Data Mining
    - 1.3 The process of Data Mining

2. Types of data for Data Mining
    - 2.1 Relational Data
    - 2.2 Data Warehouses
    - 2.3 Transactional Data
    - 2.4 Advance database system

3. Data description
    - 3.1 Clustering
    - 3.2 Link Analysis

4. Predictive Data Mining
    - 4.1 Classification
    - 4.2 Regression
    - 4.3 Time series

5. Models and Patterns
    - 5.1 Decision Trees
    - 5.2 Multivariate adaptive regression spline
    - 5.3 Rule Induction
    - 5.4 K-nearest neighbor and memory based reasoning
    - 5.5 Logistic Regression

6. Introduction to Genetic Algorithm

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