

**DEPARTMENT OF STATISTICS  
SARDAR PATEL UNIVERSITY  
VALLABH VIDYANAGAR**



**SYLLABUS EFFECTIVE FROM: 2017-18**

**MASTER OF SCIENCE (APPLIED STATISTICS)  
Course Syllabus and Structure of for M.Sc. (Applied Statistics)  
Semester – I**

PS01CAST21	Statistical Distributions and their applications	4 credits	70/30
PS01CAST22	Marketing Research.	4 credits	70/30
PS01CAST23	Operations Research-I	4 credits	70/30
PS01CAST24	Data Base Management Systems	4 credits	70/30
PS01EAST21	Statistical Computing through C++	4 credits	70/30
	OR		
PS01EAST22	Statistical Computing through R	4 credits	70/30
PS01CAST25	Practical -I	4 credits	70/30
PS01CAST26	Viva-Voce	1 credits	50

PS02CAST21	Parametric Inference and Nonparametric Inference	4 credits	70/30
PS02CAST22	Linear Models and Regression Analysis.	4 credits	70/30
PS02CAST23	Statistical Quality Control and Reliability	4 credits	70/30
PS02CAST24	Statistical Methods through SPSS	4 credits	70/30
PS02EAST21	Lean Six Sigma Methodology	4 credits	70/30
	OR		
PS02EAST22	Official Statistics	4 credits	70/30
PS02CAST25	Practicals (Based on Minitab)	4 credits	70/30
PS02CAST26	Viva-Voce	1 credits	50

PS03CAST21	Knowledge Discovery and Data Mining	4 credits	70/30
PS03CAST22	Operations Research II	4 credits	70/30
PS03EAST21	Planning and Analysis of Industrial Experiments	4 credits	70/30
PS03EAST22	Generalized Linear Models	4 credits	70/30
	OR		
PS03EAST23	Survival Analysis	4 credits	70/30
PS03CAST23	Practicals (Based on PS03CAST21 and PS03CAST22)	4 credits	70/30
PS03CAST24	Practical (Based PS03EAST21 and PS03EAST22)/ PS03EAST23	4 credits	70/30
PS03CAST25	Viva-Voce	1 credits	50

PS04CAST21	Computer Oriented Statistical Methods	4 credits	70/30
PS04EAST21	Clinical Trials	4 credits	70/30
	OR		
PS04EAST22	Econometrics	4 credits	70/30
PS04CAST22	Practicals (Based on PS04CAST21 and PS04EAST21/ PS04EAST22)	4 credits	70/30
PS04CAST23	Project	12 credits	210/90
PS04CAST24	Viva-Voce	1 credit	50

## PS01CAST21: STATISTICAL DISTRIBUTIONS AND THEIR APPLICATIONS

Unit 1	Random Experiments. Random Variables, Probability functions –probability mass and probability density function(pmf and pdf), Cumulative Distribution Function(cdf), Survival Function, Probability Generating Functions,Moments and moment Generating Funtions, Cumulants,Characteristic Functions.	12
Unit 2	Discussion on cases (real life examples) related to Binary(Bernoulli) random variables. Introduction of Bernoulli distribution and study of some properties of Bernoulli Distributions (like moments, cumulants, mean, variance, moment and cumulant generating functions, probability generating function etc). Binomial Distribution, Poisson Distribution, Geometric Distribution, Negative Binomial Distribution, Hyper geometric Distribution- Probability functions, some properties and applications. Mutinomial distribution-Probability function, properties and some applications	12
Unit 3	Exponential Distribution, Weibull Distribution, Gamma Distribution, Laplace Distribution, Cauchy Distribution and Normal Distribution, Chisquare Distribution and F-Distribution- Probability functions, properties and some applications.	12
Unit 4	Bivariate and Multivariate Distributions- Bivariate Exponential , Bivariate Normal and Multivariate Normal Distribution-Probability functions, properties and applications.	12

- 1 Berger, R. and Casella G. (2002). *Statistical Inference*, Duxbury Resource Center, Second Edition.
- 2 Dasgupta, A. (2010) *Fundamentals of Probability: A First Course*, Springer, New York
- 3 Hogg, R. V. McKean, J. W. and Craig, T. T. (2005). *Introduction to Mathematical Statistics*, Sixth Edition, Pearson Prentice Hall, New Jersy.
- 4 Rao, C. R. (2002). *Linear Statistical Inference and Its Applications*, 2nd Edition, Wiley, New York.
- 5 Rohatgi, V. K. & A. K. M. E Saleh (2001). *Introduction to Probability and Statistics*, Wiley, New York.
- 6 H, Cramer (1946) *Mathematical Methods of Statistics*, ( Prinecton).
- 7 J. D. Gibbons & S. Chakraborti (1992) *Nonparametric statistical Inference* (Third Edition) Marcel
- 8 [K. Balakrishnan](#)(1996) *Exponential Distribution: Theory, Methods and Applications*, CRC Press
- 9 [Samuel Kotz](#), [N. Balakrishnan](#), [Norman L. Johnson](#)(2000)*Continuous Multivariate Distributions, Volume 1, Models and Applications*, 2<sup>nd</sup> Ed.,Wiley

## PS01CAST22: MARKETING RESEARCH

Unit-I	Introduction to Marketing Research(MR):Definition and classification of MR, The MR process, The Role MR in Decision Making, Management Information System and Decision Support System. A case Study. Defining MR problem and Developing an Approach: Importance of Defining MR problem, the process of defining the problem and developing an approach, Tasks involved, Environmental context of the problem-Buyers Behaviour, Legal and Economic Environment. Marketing and Technological Skills.	12L
Unit-II	Research Designs:(1) Exploratory research design using secondary data-comparison of primary and secondary data. Advantages, uses and disadvantage of secondary data. Classification and sources of secondary data. (2) Qualitative Research using (a) Focus Group interview (b) Depth interviews (c) Projective Techniques.(3)Descriptive research through survey and observations –Telephone Methods, Personal Methods, Mail Methods, Electronic Methods and Observational Method. (4)Causal research – Basic experimental designs – internal and external validity of experiments.	12L
Unit-III	Primary Data: (i)Measurement and Scaling : Fundamentals. Comparative and Non comparative Scaling Techniques (ii) Questionnaire and Form Design(iii) Sampling: Sampling Designs, Initial and Final Sample size determination. Data Collection, Preparation, Analysis and Reporting: Field Work, Data Preparation , Review of data compilation, data presentation and data analysis	12L
Unit-IV	Brief Discussion on uses of multivariate techniques- multiple regression, discriminant and Logit Analysis, Factor Analysis, Cluster Analysis, Multidimensional scaling and conjoint analysis, structural equations and Path Analysis. Report Preparation and Presentation.	12L

### References

- Cooper Schindler()Marketing Research, Concept & Case  
Paul Green, Donald Tull, Gerald Albaum()Research for Marketing Decisions, 5<sup>th</sup> Ed.,PHI  
[Rajendra Nargundkar](#).( 2003) Marketing Research, Tata McGraw-Hill Education  
Beri,G.C(2008)Marketing Research, 4<sup>th</sup> Ed.(Second Reprint), Tata McGraw Hill.  
Donald S.Tull, Del I.Hawkins(1990)Marketing Research – Measurement & Methods, McMillan.  
Aakar Kumar Day (2006) Marketing Research , 7<sup>th</sup> Ed., John-Wiley & Sons.  
[Malhotra Naresh K.](#)(2010) Marketing Research: An Applied Orientation, 6/E, Pearson Education India

## PS01CAST23: OPERATIONS RESEARCH I

Unit-I	Overview of the Optimization Techniques, History of Operations Research (OR), definitions of OR, Scientific Method in OR, Methodology of OR, Applications and Scope of OR. Introduction to Linear Programming Problems(LPP), General Structure of LPP, Assumptions of LPP, Advantages and Limitations of LPP, Application of LPP.	12L
Unit-II	Mathematical formulation of the problem, Terminologies used in LPP,	12L

	Graphical Method for solving LPP, cases of degeneracy, infeasible and unbounded solutions, merits and demerits of the method.	
Unit-III	Simplex Method: Introduction, Algorithm, cases of degeneracy, infeasible and unbounded solutions, Two-Phase Method- Algorithm, cases of degeneracy, infeasible and unbounded solutions,	12L
Unit-IV	Big-M method- Algorithm, cases of infeasible and unbounded solutions, Concept of Duality, Dual Simplex method- Algorithm, cases of degeneracy, infeasible and unbounded solutions, Integer Linear Programming- Gomory Cut method- Algorithm, cases of degeneracy, infeasible and unbounded solutions.	12L

#### References

- Kambo, N.S.(1991) Mathematical Programming Techniques Affiliated East-West Press Pvt.Ltd.)
- Hadley,G. (1987) Linear Programming.
- Taha, H.A.(1992) Operations Research 5<sup>th</sup> ed. (Macmillan)
- L. C. Jhamb (2009) Quantitative techniques for managerial decisions, Vol-I& II, 16<sup>th</sup> ed. (Everest Publishing House)
- N. D. Vohra (2011) Quantitative Techniques in Management, 4<sup>th</sup> ed. (Mc Graw Hill)
- V. K. Kapoor(1998) Problems & Solutions in Operations Research, 2<sup>nd</sup> ed.(Sultan Chand & Sons)
- R Sivarethinamohan (2008) Operations Research, 1<sup>st</sup> ed.( Mc Graw Hill)
- J. K. Sharma(2009) Quantitative Techniques For Managerial Decisions, 1<sup>st</sup> ed.(Macmillan)

## PS01CAST24: DATA BASE MANAGEMENT SYSTEM

Unit-I	Introduction: File processing systems, data base systems and the evolution of database technology. Aims and importance of database technology, data independence, data sharing, data integrity, data redundancy control Data Modelling: Conceptual model, Logical Model, External model, Physical model	12L
Unit-II	INTRODUCTION TO <a href="#">ORACLE</a> DBA: ;What is DBA ? Why a Company needs a DBA? Roles & Responsibilities of DBA Oracle Architecture D ATABASE CREATION Different Startup Modes Different Shutdown Modes Types of Database Creation Manual Method of Creation TABLESPACE MANAGEMENT Introduction to Table space Types of Table space(BIG & SMALL) STORAGE PARAMETERS What are segments? What are extents? Storage Parameters(Initial, Next, Min Extents, Xtents, Pctincrease)	12L
Unit-III	USER MANAGEMENT Who are <a href="#">Database</a> Users? Why to create a User? Creation of Users Allocating table space Quotas to Users Levels of Authentication UNDO MANAGEMENT What is Undo? Why Undo required? Pending offline status Brief idea about Rollback segments Flashback Features SPFILE & OMF What is spfile? Difference between spfile and pfile NETWORKING IN ORACLE Introduction to Oracle Networking Network default location Editing Network file	12L
Unit-IV	AVAILABILITY Introduction to Data Guard Types of Standby databases 11g New features in Data Guard RMAN Cloning Automatic Storage Management(ASM) SQL-LOADER Introduction to <a href="#">SQL</a> Loader Types of files Control file AUDITING What is auditing? Why auditing performed? Types of Auditing Levels of Auditing FLASHBACK FEATURES: Flashback Database Flashback Archive(11g)	12L

### References:

- Database System Concepts,- H.F. Korth and S. Silberschatz
- Principles of Database System -J.D. Ullman
- Introduction to Database System-C.L. Date
- Fundamentals of Database System-Elmasri & Navthe :
- [Seema Kedar](#)(2009) Database Management System, Technical Publications
- [P. S. Gill](#)(2008). Database Management Systems, I. K. International Pvt Ltd
- [Das Gupta](#)(2009).Database Management System Oracle Sql And Pl/Sql, PHI Learning Pvt.Ltd.
- [S. Sumathi, S. Esakkirajan](#)(2007). Fundamentals of Relational Database Management Systems [Volume 47 of Studies in Computational Intelligence](#), Springer

## PS01EAST21: STATISTICAL COMPUTING WITH C++

UNIT 1	Introductory Concepts: Algorithm, Programming logic. Structure of C++ program, Preprocessors, Header Files, identifiers, keywords; constants: numeric, string and character; Data Types: int, char, float, bool, enumeration. Operators: arithmetic, comparison and logical operators, bitwise operators; I/O statements, manipulators	12L
UNIT 2	Control Statements: if, if else, nested if else, switch, for loop, while loop, do-while loop, break and continue statements, goto statement; conditional and unconditional. Few Programmes control statements	12L
UNIT 3	Arrays: one dimensional and multidimensional, array declaration, array initialization, processing with arrays, etc. Strings as a character array; Scope and lifetime of variables: local, global, static, automatic, external, register. Functions : introduction, defining function, return statement, types of functions, recursive functions, multifunction function overloading, call by value and call by reference, using arrays as function arguments, functions having default arguments.	12L
UNIT 4	Pointers: pointer declaration, pointer arithmetic, pointers and functions, pointers and arrays. <u>Practicals</u> : Writing some useful C++ programs for Statistical Computing.	12L

### Books Recommended:

1. Robert Lafore : Object Oriented Programming With C++, Galgotia Publishers.
2. John Hubbard (2000). Programming with C++, 2<sup>nd</sup> Edition, McGraw-Hill (Schaum's Outline Series).
3. Cay Hortsman (1999) : Computing Concepts with C++ Essentials, 2<sup>nd</sup> Edition, John Wiley & Sons.
4. Ravinchandran, D. (2011). Programming with C++, Ed. III, Tata McGraw Hill Education Pvt. Ltd., New Delhi
5. Venugopal, K. R., Rajkumar, B., RaviShankar, T. (2006). Mastering C++, Tata McGraw Hill Education Pvt. Ltd., New Delhi.
6. Balagurusamy, E. (2013). Object Oriented Programming with C++, Ed. VI, McGraw Hill Education.

## PS01EAST22: STATISTICAL COMPUTING THROUGH R LANGUAGE

- UNIT 1 Introduction to R - A programming language and environment for data analysis and graphics. 12L  
Syntax of R expressions: Vectors and assignment, vector arithmetic, generating regular sequence, logical vector, character vectors, Index vectors; selecting and modifying subsets of data set  
Data objects: Basic data objects, matrices, partition of matrices, arrays, lists, factors and ordered factors, creating and using these objects; Functions- Elementary functions and summary functions, applying functions to subsets of data.  
Data frames: The benefits of data frames, creating data frames, combining data frames, Adding new classes of variables to data frames; Data frame attributes.
- UNIT 2 Importing data files: import.data function, read.table function; Exporting data: export.data function, cat, write, and write.table functions; Outputting results - sink function, formatting output - options, and format functions; Exporting graphs - export.graph function. 12L  
Graphics in R: creating graphs using plot function, box plot, histogram, line plot, steam and leaf plot, pie chart, bar chart multiple plot layout, plot titles, formatting plot axes.  
Interactively adding information of plot - Identifying the plotted points, adding trend lines to current scatter plot, adding new data to current plot, adding text and legend
- UNIT 3 Loops and conditional statements: Control Statements; if statement, if else Statement. Looping statement; for loop, repeat, while loop 12L  
Developing simple programs in R for data analysis tasks, saving programs, executing stored programs, defining a new binary operator, assignment within function, more advanced examples, object oriented programme. Creating function libraries- library function, attaching and detaching the libraries  
Random numbers from various distributions like uniform, Normal, gamma, exponential, beta, F, Poisson, binomial, Weibull etc.
- UNIT 4 Performing data analysis tasks: Reading data with scan function, Exploring data using graphical tools, computing descriptive statistics, one sample tests, two sample tests, Goodness of fit tests, Defining Statistical Models: Introduction for defining models, Generic functions for extracting model information. 12L  
References
1. Chambers J. M. (1998). Programming with Data: A guide to S language, Springer.
  2. Venables W N and Ripley B D (2000). S Programming, Springer
  3. Everitt B. S. (1994): A handbook of Statistical Analysis using S-Plus, Chapman & Hall.
  4. Peter Dalgaard (2002). Statistics and computing: Introductory Statistics with R Springer
  5. Purohit, G.S., Gore, S.D. and Deshmikh, S.R. (2008). Statistics Using R. Narosa Publishing House



- 6 Maindonald J. and Braum, J. (2007) Data Analysis and Graphics Using R: An example-based approach Second Edition, Cambridge Series in Statistical and Probabilistic Mathematics
- 7 Hey-Jahans, C.(2012) .An R Companion to Linear Statistical Models ,CRC Press