

AC 19/3/2012  
Item No. 4.86

**UNIVERSITY OF MUMBAI**



**The revised and modified syllabus**

**POST-GRADUATE DIPLOMA IN**  
**APPLIED STATISTICS WITH**  
**SOFTWARE**

**Department of Statistics**

**(w.e.f. 2012-13)**

The revised and modified syllabus of

**POST-GRADUATE DIPLOMA IN APPLIED STATISTICS WITH SOFTWARE**

**Scheme of Examination:**

<b>Subject</b>	<b>Title</b>	<b>Internal</b>	<b>External</b>	<b>Total</b>
<b>Paper I</b>	Basic Statistics	40	60	<b>100</b>
<b>Paper II</b>	Marketing Research	40	60	<b>100</b>
<b>Paper III</b>	Regression and Linear Model	40	60	<b>100</b>
<b>Paper IV</b>	Decision Making and Forecasting	40	60	<b>100</b>
<b>Paper V</b>	Six sigma & Statistical Process Control	40	60	<b>100</b>
<b>Paper VI</b>	Medical Statistics	40	60	<b>100</b>
<b>Paper VII</b>	Multivariate Techniques	40	60	<b>100</b>
<b>Paper VIII</b>	Communication Skills , Accounting & Project	100	---	<b>100</b>

First term will consist of first four papers & Second term will consist of next four papers.

**PAPER I: BASIC STATISTICS**

1. Exploratory Data Analysis
2. Concepts of Probability
3. Concepts of Random Variable, Probability distribution, Distribution Function, Expected Value, Variance and Higher Moments.

- 4 Probability generating function, moment generating function, cumulate generating function and cumulant.
- 5 Basic discrete and continuous distributions.
- 6 Concepts of independence, jointly distributed random variables and conditional distributions, use of generating functions.
- 7 Central limit theorem and its application
- 8 Concepts of random sampling, statistical inference and sampling distribution.
- 9 Methods of estimation and properties of estimators.
- 10 Confidence intervals for unknown parameters.
- 11 Testing of hypothesis
- 12 Concepts of conditional expectation and compound distribution
- 13 Simulation

Reference Books:

1. Anderson David R., Sweeny Dewis J. and Williams Thomas A (2004): Statistics for business and economics.
2. Hogg, R., and A. Craig: Introduction to Mathematical Statistics, The Macmillan company, New York, 1959.
3. Levin Richard I and Rubin Deavid S (1994)Statistics for management. Mathematical Statistics with application.
4. Rohatgi V. K. & A. K. MD. Ehsanes Saleh (2001): An Introduction to probability theory and Mathematical Statistics Second Edition.
5. Wackesly D.D,Mondonhall III, William and Scheffer R. L.(2002):Mathematical Statistics with applications
6. Mood Alexander M., Graybill Franklin A.:(1950) Introduction to the theory of StatisticsSecond Edition,McGraw –Hill Book Company Inc.

## PAPER II: MARKETING RESEARCH

1. Definition of marketing research and market research, need for marketing research, requirement of good marketing research, manager researcher relationship, competitive and complex nature of Indian markets, role of research in new product development, packaging, branding, positioning, distribution and pricing, ethics in Business Research.
2. Steps in marketing Research.
3. Techniques for identifying management problem and research problem.
4. Meaning & types of research designs-exploratory, descriptive and casual.
5. Exploratory research designs, Sampling & data collection methods
6. Causal research designs: Data collection methods
7. Descriptive research design: Sampling methods, Types of scales, questionnaire design
8. Preparations research proposal
9. Objectives and data needs for consumer research.
10. Objectives and data needs for product research.
11. Objectives and data needs for pricing research
12. Objectives and data needs for advertising research.
13. Consumer segmentation techniques: Chi-square test of independence, Cluster analysis
14. Customer discriminating technique: Discriminant analysis
15. Product positioning techniques: Snake chart, Benefit structure analysis, Multi-dimensional scaling technique, Factor analysis
16. **CHi-squared Automatic Interaction Detector (CHAID)**
17. New product development technique: Conjoint analysis

18. Report writing

Reference Books:

1. Kinneer Thomas C and Taylor James R. (1995)  
Marketing Research : An applied Approach
2. Green Paul E., Tull Donalds, Albaum Gerald (1988): Research for Marketing Decision.
3. Nargundkar Rajendra(2003), Marketing Research Text & Cases.
4. David A. Aaker(2004) Marketing Research
5. Malhotra Naresh (2006) Marketing Research  
An applied orientation and SPSS 14.0 student CD.
6. Burns C. Alwin & Bush Ronald(2006): Marketing Research with SPSS 13.0
7. Boyd Harper W. Jr. Westfall Ralph, Stasch Stanley F. (1977)  
Marketing Research: Text & Cases
8. Harvard Business Review: Select Articles on Marketing Research.

**PAPER III: REGRESSION AND LINEAR MODEL**

1. Simple linear regression
2. Multiple linear regression
3. Regression diagnostics
4. Transformation of variable
5. Qualitative Variables as predictors
6. Analysis of collinear data
7. Logistic regression
8. Stepwise regression
9. ONE WAY ANOVA
10. TWO WAY ANOVA

11. Multiway ANOVA and Nested Analysis
12. Comparison of individual means
13. Analysis of covariance
14. One Way Random effect model
15. Two way Mixed Model

Reference Books:

1. Chatterjee Samprit, Hadi Ali S., Price Betram (2000): Regression Analysis by Example Third Edition A Wiley Interscience Publication John-Wiley and Sons
2. Draper Norman R., Smith Harry (2003): Applied Regression Analysis Third Edition
3. Kshirsagar Anant M. (1983): A course in Linear Models
4. Seber George A. F. (2003) Linear Regression Analysis
5. Dielman Terry E. (2004) Applied Regression analysis: A second course on Business and Economics Statistics.
6. Chatterjee Samprit, Handcock Marks, Simonoff Jeffrey (1994) A Caselook for a list course in Statistics and data Analysis.
7. Design and analysis of experiments(2010) 7<sup>th</sup> ed. Douglas C. Montgomery, Wiley India Pvt Ltd.
8. Design and analysis of experiements classical and regression approach with SAS, Onyiah L.C. (2008) Chapman and Hall/CRC.

## **PAPER IV: DECISION MAKING AND FORECASTING**

- 1 Decision Making under Uncertainty, Role of Probability Theory and Statistical Techniques, Forecasting-based Decision Making.
- 2 Characteristics of Decision: Unstructured or Non-Programmable Decisions, Structured or Programmable Decisions.
- 3 Quantitative Tools of Decision Making: Decision Tree, Break-even analysis, Investment appraisal, Critical Path Analysis
- 4 Qualitative Tools of Decision Making: Qualitative Factors Influencing Decision Making, SWOT Analysis, PESTEL Analysis, Six Thinking Hats Technique, Human Mindset Affecting Implementation of Decision
- 5 Statistical Rules of Decision Making: Maximin Criterion, Maximax Criterion, Minimax Regret Criterion, Laplace Criterion.
- 6 Bayesian Approach to Decision Making: Prior Analysis, Pre-posterior Analysis, Posterior Analysis, Sequential Analysis.
- 7 Step by Step Process of Decision Making.
- 8 Inventory management and introduction, inventory control, costs in inventory problems, Techniques of Inv. Control and with selective control (ABC analysis, Usage rate and criticality)
- 9 Techniques of inv. Control and with known demand and E.O.Q with uniform demand, prod. Runs of unequal length, with finite rate of replenishment, Problem of E.O.Q with shortage
- 10 Techniques inv. Control and with uncertain demand and buffer stock computation, stochastic problems and uniform demand.
- 11 Techniques inv. Control and with price discounts
- 12 Break even analysis, Marginal Costing

### Reference Books:

1. Mayes Timothy R., Shack Todd. M(2006).: Financial Analysis with Microsoft Excel.

2. Martin Mindy C., Hansen Steven M., Klingher Beth,(1996): Mastering Excel 2000 Premium Edition.
3. Spyros G Makrindakis Steyan C. Wheelwright Rob J. Hyndman: Forecasting: Methods & Applications
4. Hanke,John E.,Reitsch Arthur G.,Wichern Dean W.: Business Forecasting 7<sup>th</sup> Edition

### **PAPER V: SIX SIGMA AND STATISTICAL PROCESS CONTROL.**

- 1            7 QC tools, 7 New QC tools
- 2            Control Charts for variables
- 3            Six sigma , Lean Sigma
- 4            Process and measurement system capability analysis
- 5            Factorial and Fractional factorial experiments for process design and improvement
- 6            Response surface methods and designs
- 7            Taguchi techniques
- 8            Japanese System
- 9            ISO 9000
- 10          Project Planning
- 11          Statistics in software development process

#### Reference Books:

1. Montgomery Douglas C. (2004): Introduction to statistical quality control Fourth Edition.
2. Phadke Madhav S. (1989): Quality Engineering Using Robust Design
3. Kaoru Ishikawa(1986): Guide To Quality Control Second Edition.
4. Genichi Taguchi ( 1991): Introduction to Quality Engineering: Designing Quality into Products and Processes Second Edition.
5. Brassard Michael & Diane Riffer (1994): The Memory Jogger II
6. Harry Mikel & Schroeder Richard (1999): Six Sigma The Breakthrough Management.



7. Pande Peter S., Neuman Robert P. & Cavanagh Rolana R.(2002): (Six Sigma Way Team) An Implementation Guide for Process Improvement.

#### **PAPER VI: MEDICAL STATISTICS**

- 1 Phase I, II and III Clinical Trials
- 2 Randomization
- 3 Blinding and Placebos
- 4 Sample size calculation
- 5 Nonparametric Tests: Fisher's exact test, Wilcoxon Signed Rank test, Wilcoxon Rank Sum test, Mann-whitneyUtest, Kruskal-Wallis test.
- 6 Comparing more than two treatments.
- 7 Causality, Non-compliance and Intent-to-treat
- 8 Survival analysis in Phase III clinical trials
- 9 Early stopping of clinical trials
- 10 Multiplicity and interim analysis
- 11 Parallel and Crossover designs
- 12 Binary Response data, Categorical Data Analysis
- 13 Comparing Methods of measurements.
- 14 Meta analysis
- 15 Repeated measures analysis

#### Reference Books:

1. .Shoukri M. M., Pause C. A.(1999): Statistical Methods for Health Sciences Second Edition.
2. Davis Charles S.(2002): Statistical Methods for the Analysis of Repeated Measurements.
3. Finney D,J(1964): Statistical Method in Biological Assays.
4. Fleiss Joseph L.,Levin Bruce & Paik Myunghee Cho (2003): Statistical Methods for Rates and Proportions
5. Dr. Fieller Nick(2007): Medical Statistics: Clinical Trials
6. Zhang Daowen (2007): Statistical Principles of Clinical Trials  
(Lecture Notes)

## **PAPER VII: MULTIVARIATE TECHNIQUES**

- 1 The organization of Data
- 2 Applications of Multivariate Techniques.
- 3 Data Display and Pictorial Representation.
- 4 Assessing the Assumption on Normality
- 5 Detecting Outliers and Data Cleaning
- 6 Transformations to Near Normality
- 7 Hotelling's  $T^2$  and Likelihood Ratio Tests
- 8 Confidence Regions and simultaneous Comparisons of Component Means.
- 9 Large Sample Inferences about a Population Mean Vector
- 10 The Classical Linear Regression Model.
- 11 Graphing the Principal Components
- 12 Large Sample Inferences
- 13 The Orthogonal Factor Model
- 14 Methods of Estimation
- 15 Factor Scores
- 16 Factor Rotation
- 17 Perspectives and a Strategy for Factor Analysis
- 18 Cluster Analysis
- 19 Discrimination and Classification
- 20 Multi Dimensional Scaling

### **Reference Books:**

1. Johnson, Richard A. & Wichern, Dean W(2007).: Applied Multivariate Statistical Analysis.

2. Seber, G.A.F(1984).: Multivariate observations
3. Bishop Yvonne M. M., Fienberg S. E., Holland P. W.(1975): Discrete Multivariate Analysis Theory and Practice.

**PAPER VIII Communication Skills, Accounting and Project Communication**

**Module I : COMMUNICATION SKILLS**

- 1 Spoken & Written communication
- 2 Preparing and organizing a public speech: Topic selection, Research Methods, Overcoming anxiety, arranging main points, Constructing introductory and concluding remark; Development and delivering informative-style and persuasive-style, speeches; Debating: Fundamentals of debating, Premises and process of debate, Basic rules & language, Building & processing cases, Rebuttal arguments, Timing, Roles of the speakers, Judges & moderator; Debating style: Parliamentary, Academic, Cross- examination informal and impromptu speaking exercises.
- 3 Politics & governance, Business, Social, Morals & ethics, Culture & education, Law & order, Science & technology, Handling questions.
- 4 Personal communication, Business communication, Report Writing.
- 5 Fundamentals of Presentations: Effective presentation- understanding effective presentation, understanding different types of presentation; Planning presentations: Establishing objectives, Determining objectives, Making realistic objectives;
- 6 Analysing audience, Selecting supporting material, Understanding the types of supporting materials, Exploring retention & visual aids; Building presentation: Developing introduction, Capturing attention of audience, Organizing body of presentation, Creating conclusions, Closing presentation; Presentation mechanism: Power point, Visual aids, Speaker notes & footnotes, Reviewing presentations.

**Reference Books:**

1. Bahl Sushil (1996): Business Communication Today
2. C. S. Rayadu: Media & Communication Management.
3. Thrill V. John, Bovee Courtland (2004): Excellence in Business Communication.

- Nichols Ralph G., Leonard A. Stevens, Bartolome Fernando, Argyris Chris (1999): Harvard Business Review on Effective Communication.

### **Module II: Accounting**

- Introduction to Accounting – Basic Accounting Terms, Need and Importance of Book-keeping – Accounting
- Conceptual Frame work of Accounting - Basic assumptions – Basic concepts –Accounting Standards
- Double entry system – Account – Golden rules of accounting.
- Basic Accounting Procedures – Journal, Ledger, Trial Balance
- Final Accounts - Trading account – Profit and loss account – Balance sheet – Preparation of Final Accounts.vv

#### **Reference Books:**

- Advanced Accounts – M.C. Shukla, T.S. Grewal
- Book Keeping and Accountancy – Choudhari, Chopde.

### **Module III : PROJECT**

Students should carry out the project on Statistical Application based on data

**Note:** All the course will be taught using Statistic Software such as

**R/SAS/SPSS/MINITAB.**

Project , Communication skills & Accountancy:

Communication Skill	30
---------------------	----

Accountancy	20
-------------	----

Project:

- |       |                                    |           |
|-------|------------------------------------|-----------|
| (i)   | Participation or Role              | 10        |
| (ii)  | Evaluation by project guide        | 20        |
| (iii) | Presentation (external assessment) | <u>20</u> |
|       |                                    | <b>50</b> |

**Resolutions:**

1. Students with B.A /B.Sc. (Statistics major) are exempted from entrance test.
2. **Fee** should be increased from Rs.40000 to Rs. 50,000/-
3. The Programme will not be conducted if number of students is less than 15.
4. We propose to increase the number of seats for PGDASS programme from 50 to 60 as there is huge demand for this programme.

**Standard of Passing:**

1. A candidate securing a minimum of 200 marks out of 400 marks, with a minimum of 40 marks in each of the four papers, consisting of internal and external examination taken together will be declared to have passed in that examination.
2. If in a paper a candidate secures minimum of 50% marks consisting of internal and external examination taken together, will be exempted from that paper.