

**PONDICHERY UNIVERSITY
PONDICHERY**

**POST GRADUATE DIPLOMA IN STATISTICAL AND
RESEARCH METHODS
(SEMESTER PATTERN)**

Effective from 2009-2010 (Onwards)



DEPARTMENT OF STATISTICS

PONDICHERRY UNIVERSITY
POST GRADUATE DIPLOMA IN STATISTICAL AND RESEARCH METHODS
(SEMESTER PATTERN)

REGULATION & SYLLABUS

The syllabus shall be effective from the academic year 2009-2010 onwards.

AIM OF THE COURSE:

The P.G. Diploma in Statistical and Research Methods aims to train the students both in the theoretical development and in the real life applications of modern statistical methodology. It will provide a platform for getting exposed to real life data and their statistical analysis.

ELIGIBILITY FOR ADMISSION:

Candidates for admission to the above P.G. Diploma shall be required to have U.G./P.G. degree of Pondicherry University or any other university equivalent thereto with a minimum of 45% of marks in the qualifying examinations. For SC/ST/PH a mere pass in the qualifying examination will be sufficient. Candidates studying in the fourth year/ fifth year of the Five year integrated programme are also eligible.

DURATION OF THE COURSE:

The duration of the P.G. Diploma course shall be one academic year of two semesters.

MEDIUM OF INSTRUCTION:

The medium of instruction is English.

ATTENDANCE:

A candidate shall be permitted to appear for the examination in a subject of study only if He/She secures not less than 70% of attendance in the subject concerned.

SCHEME OF EXAMINATION:

All the theory and practical examinations will be of three hours duration. The maximum marks for each subject shall be 100. The weightage of marks for internal assessment and end semester examinations shall be 20 and 80 respectively. Passing minimum for theory and practical examinations should be 40 (internal assessment and end semester marks put together). A candidate who does not pass the examination in any subject(s) shall be permitted to appear in such failed subject(s) in the subsequent semester examinations.

The maximum duration for passing the entire course is two years.

The 20 marks of internal assessment component shall consist of the following:

(a)	Written test (2 class tests)	= 15 marks
b)	Written assignments	= 5 marks
	TOTAL	= 20 marks

CLASSIFICATION OF SUCCESSFUL CANDIDATE:

1. Candidates who pass all the examinations in the first appearance and secure an aggregate of not less than 60% of the total marks in the University examinations shall be declared to have passed the examination for the diploma in First Class.
2. Candidates who pass all the examinations in the first appearance and secure an aggregate of not less than 50% but less than 60% of the total marks in the University examinations shall be declared to have passed the examination for the diploma in Second Class.
3. All other successful candidates in the University examinations shall be declared to have passed the examination for the diploma.

REVISION OF REGULATIONS AND CURRICULUM:

The University may from time to time revise, amend and change the Regulations and Curriculum, if found necessary.

POST GRADUATE DIPLOMA IN STATISTICAL AND RESEARCH METHODS

Subjects	Credits	Internal Marks	End Semester	
I Semester				
PGDS611	RESEARCH METHODOLOGY	2	20	80
PGDS612	BASIC STATISTICS	2	20	80
PGDS613	PROBABILITY AND DISTRIBUTION	3	20	80
PGDS614	APPLIED STATISTICS– I	3	20	80
II Semester				
PGDS621	ESTIMATION AND HYPOTHESES TESTING	3	20	80
PGDS622	APPLIED STATISTICS–II	3	20	80
PGDS623	STATISTICAL QUALITY CONTROL AND OPERATIONS RESEARCH	2	20	80
PGDS624	PRACTICAL	2	20	80

SEMESTER I
PGDS611 – RESEARCH METHODOLOGY

UNIT 1

Meaning of Research – Objectives of Research – Approach to Research – Significance of Research – Types of Research – Research in Social Sciences – Facts, Theories and Concepts in Social Science Research – Research Design – features of a Good research Design

UNIT 2

Research Problem – Identifying the research Problem – Formulation of Research problem – concept of Hypothesis – Role and Formulation of Hypothesis – Scientific Methods of Research – Nature of Scientific research – Stages of Scientific Method

UNIT 3

Logic and scientific Method – Deductive and Inductive Methods – The Case Study Method – Merits and Demerits of Case Study Methods – Survey Methods - Merits and Demerits of Survey Methods – Types of survey – Selecting the Survey Method – Sample surveys – Different Types – Merits and Demerits

UNIT 4

Schedule and questionnaire – Principle underlying the Construction of Questionnaire – measurement and scaling Techniques – Processing and Analysis of Data

UNIT 5

Interpretation and report writing – Steps – Bibliography, Quality of a good Research Report

Books for Study:

1. C.R. Kothari, Research Methodology, Wiley Eastern Ltd., New Delhi, 2002.
2. W.G. Cochran, Sampling Techniques, John Wiley and Sons, New York, 1963.
3. W.J. Goode and P.K. Hatt, Methods in Social Science Research, McGraw Hill, New York, 1952.
4. T.S. Wilkson and P.L.Bhandarkar, Methodology and Techniques of Social Research, Himalaya Publishing House, Bombay, 1979.
5. Ram Ahuja (2001): Research Methods, Rawat Publications, New Delhi

SEMESTER I
PGDS612 - BASIC STATISTICS

UNIT 1

Introduction to Statistics – Primary and Secondary data – Nominal, Ordinal, Ratio, Interval scales - Graphical Representation of data: Bar-charts, Pie-diagrams- classification of data, frequency histograms, polygon, Ogives

UNIT 2

Measures of central tendency: Mean, median and mode, their properties and graphical significance - percentiles – weighted means

UNIT 3

Measures of dispersion: Mean deviation, standard deviation and their properties – Coefficient of variation – Skewness and Kurtosis – Pearson's and Bowley's coefficients of skewness

UNIT 4

Simple correlation – Karl Pearson's coefficient of correlation – Rank correlation – Regression – lines of regression – properties of regression coefficients - Association between attributes – Independence of attributes and measures of association for 2x2 and pxq cases

UNIT 5

Curve fitting – Principle of least squares – Fitting of Straight line, Second degree and exponential models – Linear Regression with two independent variables – Multiple and Partial correlation coefficients in three variables and their properties

Books for Study:

1. Bhat B.R, Srivenkataramana T and Rao Madhava K.S.(1996): Statistics: A Beginner's Text, Vol. I, New Age International (P) Ltd.
2. Goon A.M, Gupta M.K., Das Gupta B. (1991): Fundamentals of Statistics, Vol. I, World Press, Calcutta.
3. Spiegel M R (1989): Schaum's Outline of Theory and Problems in Statistics, Schaum's Outline Series.
4. Ken Black (2004): Business Statistics for Contemporary Decision Making, 4/e, John Wiley and Sons

Books for Reference:

5. Croxton F.E, Cowden D.J and Kelin S (1973): Applied General Statistics, Prentice Hall of India.

SEMESTER I
PGDS613 - PROBABILITY AND DISTRIBUTION

UNIT 1

Introduction to probability theory – Random experiments, Events, Sample space – Classical approach to probability – Axiomatic approach to probability – Simple problems - Addition theorem - Conditional Probability – Independence of events – Multiplication theorem – Bayes theorem and its applications

UNIT 2

Random variables – Discrete and Continuous Random Variables – Probability Mass function and Probability Density function – properties - Mathematical Expectation of random variables, its properties and applications

UNIT 3

Discrete Distributions – Uniform, Bernoulli, Binomial, Poisson, Geometric distributions, their Properties and applications

UNIT 4

Continuous distribution - Uniform, Normal, Exponential distributions, their Properties and applications – Use of tables - Law of large numbers – Central Limit Theorem – application of normal distribution to evaluate binomial and poisson probabilities

UNIT 5

Sampling distributions: t, F and chi-square distributions and their properties – sampling distributions of statistic based on the samples from normal distribution leading to the above distributions – standard errors – standard errors of common sampling distributions

(no proof of any result is expected)

Books for Study:

1. Hogg R. V. and Craig A. T. (1998); Introduction to Mathematical Statistics, 4/e, Academic press.
2. Bhat B.R, Srivenkataramana T and Rao Madhava K.S.(1996): Statistics: A Beginner's Text, Vol. II, New Age International(P) Ltd.
3. Mood A.M., Graybill F.A and Boes D.C. (1974): Introduction to the Theory of Statistics, McGraw Hill.
4. Ken Black (2004): Business Statistics for Contemporary Decision Making, 4/e, John Wiley and Sons

Books for Reference:

1. Meyer P.L. (1970): Introductory Probability and Statistical Applications, Addison Wesley.
2. Goon A.M, Gupta M.K., Das Gupta B. (1980): An Outline of Statistical Theory, Vol. I, 6th revised edition, World Press, Calcutta.

SEMESTER I
PGDS614 - APPLIED STATISTICS –I

UNIT 1

Concept of time series, components of a time series – Additive and Multiplicative models – Resolving the components of a time series – Evaluation of trend by least square method – Methods of moving averages.

UNIT 2

Seasonal indices – Simple average, Ratio to moving average – Ratio to trend – Concept of Cyclical fluctuations – Prediction in time series

UNIT 3

Index numbers: Definition and uses – Main steps in the construction of index numbers – Fixed and Chain base index numbers - Laspeyre's, Paasche's, Fisher's, Marshall – Edgeworth index numbers - Optimum tests for index numbers - Construction and uses of cost of living and wholesale price index numbers

UNIT 4

Census and sample surveys – Advantages and disadvantages – principal steps in a sample survey – probability and non-probability sampling – sampling and non-sampling errors – Various sampling methods - Simple random sampling – Stratified Sampling – Systematic sampling

UNIT 5

Present official statistical system in India – Methods of collection of official statistics – their reliability and limitations – Principal publications containing data on topics such as population, agriculture, industry, trade, prices, labour and employment, transport and communications, banking and finance – Various official agencies responsible for data collection and their main functions

Books for Study:

1. Goon A.M, Gupta M.K., Das Gupta B. (1991): Fundamentals of Statistics, Vol. II, World Press, Calcutta.
2. Kapoor V.K. and Gupta S.C. (1978): Fundamentals of Applied Statistics, Sultan Chand ans Sons.
3. Ken Black (2004): Business Statistics for Contemporary Decision Making, 4/e, John Wiley and Sons
4. Saluja M.R. (1972): Indian official Statistical Systems, Statistical Publishing Society, Calcutta and The Indian Econometric Society, Hyderabad.

Books for Reference :

1. Croxton F.E, Cowden D.J and Kelin S (1973): Applied General Statistics, Prentice Hall of India.
2. Mukhopadhyay P. (1999): Applied Statistics, New Central Book Agency Pvt. Ltd., Calcutta.

SEMESTER II

PGDS621 - ESTIMATION AND HYPOTHESES TESTING

(Description of the methodology and their application alone is to be emphasized)

UNIT 1

Problem of statistical inference – Population and random sample - Point estimation – Estimators and their standard errors – Unbiased and minimum variance estimator - Interval Estimation - Concepts of Confidence Interval and Confidence Coefficient - Confidence Intervals for proportion, mean, variance and correlation coefficient

UNIT 2

Statistical Hypothesis testing – Simple and composite hypothesis, Null and Alternative Hypothesis – Two types of errors – Critical region – p-value – Power of a test – Most powerful test - Exact tests for mean, variance and correlation coefficient for a single population based on Normal, Student's t, Chi-square distributions

UNIT 3

Exact tests based on Normal, Student's t, F-distribution for testing the equality of parameters of two populations (mean, variance and correlation coefficient) – Tests for homogeneity of means and variances for several populations

UNIT 4

Large sample tests for the parameters of one and two populations (proportions, means and variances) – Chi square test for homogeneity of several population proportions and goodness of fit tests

UNIT 5

Non-parametric methods: Sign test – Wilcoxon Signed rank test- Mann Whitney U test - Median test - Kolmogrov-Smirnov test – Kruskal Wallis test – Friedman test

Books For Study:

1. Mood A M, Graybill F A and Boes D C(1974): Introduction to Theory of Statistics, McGraw Hill Publishing Co., New York
2. Goon A.M, Gupta M.K., Das Gupta B. (1980): An Outline of Statistical Theory, Vol. 2, 6th revised edition, World Press, Calcutta.
3. Hogg R.V. and Tanis E.A.(2001) : Probability and Statistical Inference, Pearson Education Asia.
4. Ken Black (2004): Business Statistics for Contemporary Decision Making, 4/e, John Wiley and Sons

Books for Reference:

1. Freund J.E. (2000): Mathematical Statistics, Prentice Hall of India.
2. Mukhopadhyay, P.(2006); Mathematical Statistics, Books and Allies(P) ltd, Kolkata

SEMESTER II
PGDS622 - APPLIED STATISTICS –II

UNIT 1

Multiple regression model with two independent variables – Determination of the regression coefficients – study of residuals and estimate of the residual variance – Testing the overall model – Testing the significance of the regression coefficients – R^2 and its interpretation

UNIT 2

Multiple regression with more than two independent variables – Polynomial representation – Regression model with indicator variables – model building and search problem (all possible regression – stepwise regression – forward selection and backward elimination) – multicollinearity problem and methods of overcoming them

UNIT 3

Terminology in experimental designs – Basic Principles of Experimentation: Replication, Randomization and Local control – Completely Randomized design – Randomized Block design – Latin Square design – Analysing data arising from such designs – Multiple Comparison tests : Duncan's Multiple Range test, LSD, SNK test

UNIT 4

Vital Statistics: Measures of mortality – crude and specific rates – infant mortality rate – direct and indirect standardization of death rates – complete life table – structure – interrelationship among life functions – uses of life table – Fertility rates – General, specific and total fertility rates – Measures of population growth – GRR and NRR

UNIT 5

Scaling Procedures: Scaling individual items in terms of difficulty – scaling of scores on a test: Z, standard, normalized, T and percentile scores – Scaling of rankings and codings in terms of normal curves – Reliability of test scores – Index of reliability – Methods of determining test reliability - Validity of test scores: Types of validity of test scores and their estimation – comparison between validity and reliability

Books for Study:

1. Kapoor.V.K. and Gupta.S. (1978) : Fundamentals of Applied Statistics,Sultan Chand and Sons.
2. Goon.A.M., Gupta.M.K. and DasGupta .B (1999) : Fundamental of Statistics , Vol II , World Press , Calcutta.
3. Das.M.N. and Giri.N.C. (1986): Design and analysis of experiments , Wiley eastern

Books for Reference:

1. Goon.A.M., Gupta.M.K. and DasGupta .B (1999) : Fundamental of Statistics , Vol II , World Press , Calcutta.

SEMESTER II
PGDS623 – STATISTICAL QUALITY CONTROL AND
OPERATIONS RESEARCH

Unit 1

Concept of Quality – Quality movement in India – Standardization for Quality –Quality management – Quality circles – Total Quality Management – ISO 9001- Need for SQC in industries – process control – chance and assignable causes of variations – concepts of specification and tolerance limits – process capability

Unit 2

Control charts – control chart for variables – X bar and R chart - their construction and analysis - Control charts for attributes – p chart (defective) and c chart (defect)

Unit 3

Introduction to Operations Research – Principal Components of a Decision problem – Phases of Operations Research study - Linear Programming – Formulation and Graphical Solution

Unit 4

Transportation problem – North West Corner rule, Least Cost Method, Vogel's Approximation Method - Assignment problem – Sequencing models - Replacement problems: Replacement of items that deteriorate with time

Unit 5

Game Theory: Zero sum games – Strategies – Two person games – Minimax- Maximin principle – Games with saddle points – Games without saddle points – Mixed strategies – Dominance principle – Graphical method of solving game – Alternative methods for simple problems

Books for study:

1. Hamdy.A.Taha(1999): Operations Research, 6th Edition, Macmillan Publishing Co. Inc.
2. Kanti Swarup et al.: Operations Research, Sultan Chand and Sons, New Delhi.
3. S.C.Gupta and V.K.Kapoor(1999), Fundamentals of Applied Statistics, Sultan Chand and Sons.
4. Ken Black (2004): Business Statistics for Contemporary Decision Making, 4/e, John Wiley and Sons

Books for Reference:

1. Hillier F.S. and Libermann G.J.: Introduction to Operations Research, McGraw Hill.
2. Sharma J.K.(2001): Operations Research: Theory and Applications, Macmillan India Ltd.

SEMESTER II
PGDS624 - PRACTICAL

1. Diagrammatic Representation – Bar Chart, Pie Diagram
2. Construction of Discrete and Continuous Frequency Tables from raw data and their Graphical Representations - Histogram
3. Summary Statistics
4. Simple correlation, Rank correlation
5. Partial and multiple correlation
6. Fitting of straight line, second degree and exponential curves, estimating error variance and associated tests
7. Fitting of Binomial, Poisson and Normal Distributions and testing the goodness of fits
8. Large Sample Tests: Means, Variances and Proportions
9. Chi-square test for independence – test for variances using chi square and F test
10. Tests based on t statistic: Single men, Difference of means, Paired t test
11. Non-parametric tests – Sign test, Wilcoxon test, Mann-Whitney U test, Median test, Run test
12. Kruskal Wallis and Friedman tests
13. Analysis of data from CRD, RBD and LSD

Training in the use of statistical softwares for the above topics will be given.