PONDICHERRY UNIVERSITY
PONDICHERRY

Revised Syllabus for

B.Sc (STATISTICS)
(SEMESTER PATTERN)

Effective from 2009-2010 (Onwards)
PREAMBLE

PONDICHERRY UNIVERSITY
B.Sc DEGREE COURSE

REVISED REGULATION & SYLLABUS
(UG PROGRAMME IN STATISTICS)

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

AIM OF THE COURSE:

The Degree of Bachelor of Science in Statistics 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 using modern statistical softwares. It is also aimed to train the students to enable them to find an appropriate place in the modern Information Technology oriented society.

ELIGIBILITY FOR ADMISSION:

Candidates for admission to the first year of the B.Sc (Statistics) degree shall be required to have passed the Higher Secondary course examination (+2) conducted by the Government of Tamil Nadu with Mathematics or Statistics as one of the core subjects or similar examinations conducted by any other Board recognized as equivalent thereto by the Pondicherry University.

DURATION OF THE COURSE:

The duration of the B.Sc (Statistics) degree course shall be for three academic years of six semesters.

AGE LIMIT:

The rules as applicable to other undergraduate courses as prevailing in Pondicherry University.

COURSE OF STUDY:
FOUNDATION COURSE

The course of study for the B.Sc (Statistics) degree shall comprise of the following.

Part I - Language – Tamil/French/Hindi
(Under B.Sc Pattern for four semesters – I year and II year only)

Any one of the Part I language under the option of the candidate for first year and second year only.
Part II - English
(Under B.Sc Pattern for four semesters – I year and II year only)

The syllabus and text books for the above said language papers shall be prescribed by the Pondicherry University from time to time.

Part III- Main subjects & Allied subjects (Theory and Practical)

EXAMINATION:
There shall be examinations at the end of each semester i.e. December/May. 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. No candidate shall be permitted to register for a subsequent examination without having registered at the first appearance. Rules and regulations prevailing in the University in respect of other courses will be followed.

The results of all the examinations will be communicated to the candidates through the Principals of the College.

SCHEME OF EXAMINATION:
All the theory and practical examinations will be of three hours duration. The maximum marks for each subject shall be 100. Passing minimum for theory and practical examination should be 40. Practical examinations with maximum marks 50 shall have the passing minimum 20.

EVALUATION:
Theory examinations will be evaluated by the Pondicherry University. Practical examination will be evaluated by a team of two examiners one – an external expert in the subject from another academic institution selected by the Pondicherry University and the other – an internal examiner from the college.

ATTENDANCE:
A candidate shall be permitted to appear for the examination in a subject of study only if
1. He/She secures not less than 80% of attendance in the subject concerned.
2. He/She may be allowed to appear for the examination under condonation category not below 60% of attendance.

CLASSIFICATION OF SUCCESSFUL CANDIDATE:
1. Candidates who pass all the examinations in all the 3 years and secure an aggregate of not less than 60% of the total marks in Part III of the University examinations shall be declared to have passed the examination for the degree in First Class.
2. Candidates who pass all the examinations in all the 3 years and secure an aggregate of not less than 50% but less than 60% of the total marks in the Part III of the University examinations shall be declared to have passed the examination for the degree in Second Class.
3. All other successful candidates who secure not less than 40% but less than 50% of the total marks in Part III of the University examinations shall be declared to have passed the examination for the degree in Third Class.
4. For purpose of declaring a candidate to have qualified for the degree of B.Sc(Statistics) in First Class/Second Class/Third Class, marks obtained in Part III alone will be the criteria, provided he/she has secured the prescribed passing minimum in Part I and Part II.

5. There shall be no classification for Part I and Part II.

AWARD OF THE DEGREE:
The candidate should have undergone the prescribed course of study for a period of not less than 3 years and passed the prescribed examinations in all the papers/years.

REVISION OF REGULATIONS AND CURRICULUM:
The University may from time to time revise, amend and change the Regulations and Curriculum, if found necessary.

B.Sc (STATISTICS) – SCHEME OF EXAMINATION

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Lecture Hrs./week</th>
<th>Exam Marks</th>
<th>Pass Min.</th>
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<td>I Semester</td>
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<td>1. Part I</td>
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<td>TAMIL/HINDI/FRENCH -I</td>
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<td>2. Part II</td>
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<tr>
<td>ENGLISH – I</td>
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<tr>
<td>3. MAJOR PAPER I</td>
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<tr>
<td>BASIC STATISTICS</td>
<td>4</td>
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<tr>
<td>4. MAJOR PAPER II</td>
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<tr>
<td>PROBABILITY AND DISTRIBUTION -I</td>
<td>6</td>
<td>100</td>
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<td>5. ALLIED PAPER I</td>
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<tr>
<td>MATHEMATICS FOR STATISTICS – I</td>
<td>6</td>
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<td>6. MAJOR PRACTICAL – I</td>
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<td>(MS-WORD &amp; MS-EXCEL – BASIC STATISTICS)</td>
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<td>II Semester</td>
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<td>7. Part I</td>
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<td>TAMIL/HINDI/FRENCH- II</td>
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<td>8. Part II</td>
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<td>ENGLISH – II</td>
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<td>9. MAJOR PAPER III</td>
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<tr>
<td>PROBABILITY AND DISTRIBUTION -II</td>
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<td>10. MAJOR PAPER IV</td>
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<tr>
<td>NUMERICAL METHODS</td>
<td>6</td>
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<td>11. ALLIED PAPER II</td>
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<td>MATHEMATICS FOR STATISTICS – II</td>
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<td>Subjects</td>
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<td>ENGLISH – III</td>
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<td>STATISTICAL ESTIMATION THEORY</td>
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<td>16. MAJOR PAPER VI</td>
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<td>REAL ANALYSIS – I</td>
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<td>COMPUTER PROGRAMMING – I</td>
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<td>TESTING OF HYPOTHESES</td>
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<td>(STATISTICAL ESTIMATION THEORY &amp; TESTING OF HYPOTHESES)</td>
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<td>Subjects</td>
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<td>27. MAJOR PAPER IX</td>
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<td>SAMPLING METHODS</td>
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<td>28. MAJOR PAPER X</td>
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<td>DESIGN OF EXPERIMENTS</td>
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<td>29. MAJOR PAPER XI</td>
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<td>REGRESSION ANALYSIS</td>
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<td>30. MAJOR PAPER XII</td>
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<td>STOCHASTIC PROCESSES AND THEIR APPLICATIONS</td>
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<td>31. MAJOR PAPER XIII</td>
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<td>VISUAL BASIC</td>
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<td>32. MAJOR PRACTICAL – IV</td>
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<td>(VISUAL BASIC)</td>
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<td>33. MAJOR PRACTICAL – V</td>
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<td>(DESIGN OF EXPERIMENTS, SAMPLING METHODS, REGRESSION ANALYSIS)</td>
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<td>VI Semester</td>
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<td>34. MAJOR PAPER XIV</td>
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<tr>
<td>STATISTICAL QUALITY MANAGEMENT</td>
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<td>35. MAJOR PAPER XV</td>
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<tr>
<td>APPLIED STATISTICS</td>
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<td>36. MAJOR PAPER XVI</td>
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<td>OPERATIONS RESEARCH</td>
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<td>37. MAJOR PAPER XVII</td>
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<tr>
<td>HEALTH STATISTICS AND POPULATION DYNAMICS</td>
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<td>38. MAJOR PAPER XVIII</td>
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<td>39. MAJOR PRACTICAL – VI</td>
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<td><strong>TOTAL</strong></td>
<td><strong>2700</strong></td>
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Total Aggregate Marks = 2700

LIST OF ELECTIVES

1. ACTUARIAL STATISTICS
2. INDUSTRIAL STATISTICS
3. APPLIED DECISION-MAKING
4. JAVA
5. DATA BASE MANAGEMENT SYSTEM
6. BIOINFORMATICS
7. STATISTICAL GENETICS
8. PROJECT WORK
SEMESTER I
MAJOR PAPER I: BASIC STATISTICS
(4 hours per week – 3 lecture-hours and 1 tutorial/seminar session per week)

UNIT 1
Introduction to Statistics – Primary and Secondary data – Nominal, Ordinal, Ratio, Interval scale (with examples) - Graphical Representation of data – Bar-charts, Pie-diagrams- classification of data, frequency histograms, polygon, Ogives

UNIT 2
Measures of central tendency – different averages and their properties – weighted means – graphical location of median, quartiles, deciles, percentiles, and mode – relation between arithmetic mean, geometric mean and harmonic mean.

UNIT 3
Measures of dispersion and their properties – Coefficient of dispersion – Coefficient of variation – Moments – Relation between moments about mean in terms of moments about any point – Pearson’s β and γ coefficients.

UNIT 4

UNIT 5

Books for Study:

Books for Reference:
SEMESTER I
MAJOR PAPER II: PROBABILITY AND DISTRIBUTION - I
(6 hours per week – 5 lecture-hours and 1 tutorial/seminar session per week)

UNIT 1
Introduction to probability theory – Random experiments, Events, Sample space, Algebra of events, Operations on events – Classical approach to probability – Axiomatic approach to probability – Simple problems.

UNIT 2

UNIT 3

UNIT 4
Moment generating function– Cumulant generating function – Characteristic function – Probability generating function – Definition, their properties and applications – Simple problems.

UNIT 5

* Content and treatment should be as in the book by Hogg and Craig

Books for Study:

Books for Reference:
SEMESTER I
ALLIED PAPER I: MATHEMATICS FOR STATISTICS – I
(6 hours per week – 5 lecture-hours and 1 tutorial/seminar session per week)

UNIT 1
Logarithmic differentiation - Differentiation of one function with respect to another function - Differentiation involving parametric equations - Differentiation of implicit functions - Increasing and decreasing functions.

UNIT 2
Successive differentiation – Leibnitz theorem – Partial differentiation – Maxima and Minima of functions of two variables

UNIT 3
Integration - Properties of definite integrals - Reduction formula - Bernoulli’s formula

UNIT 4
Double and Triple integrals - Evaluation in simple cases only - Use of Jacobian of transformation

UNIT 5
Beta and Gamma Integrals: Definitions - recurrence formula for Gamma integral - Properties of Beta integral - Relation between Beta and Gamma integrals.

Books for study
2. Shanti Narayanan: Differential and Integral Calculus, Chand and Co.
SEMESTER I
MAJOR PRACTICAL – I
(MS-WORD & MS-EXCEL – BASIC STATISTICS)
(2 hours per week)

MS-WORD
1. Text Manipulations and Text Formatting
2. Usage of Header, Footer, Bulleting and Numbering
3. Usage of Spell Check, Find and replace
4. Picture insertion and alignment
5. Creation of documents using templates
6. Mail Merge

MS-EXCEL
7. Cell Editing and Formatting
8. Usage of Formulae and Built-in functions
9. Data Sorting
10. Data Filter, Validation, Subtotals
11. Graph
12. Usage of Auto Formatting
13. Classification, Tabulation and Frequency Tables
14. Bar Chart, Pie Diagram and Histogram
15. Box Plots
16. Summary Statistics

Six questions to be set. Candidates may be required to answer four questions.

Max. Marks: 50 – Practical Marks: 40 – Record Marks: 10
Duration of exam – 3 hours
SEMESTER II
MAJOR PAPER III: PROBABILITY AND DISTRIBUTION - II
(4 hours per week – 3 lecture-hours and 1 tutorial/seminar session per week)

Unit 1
Discrete Distributions – Bernoulli, Binomial, Poisson, Negative Binomial, Geometric, Hyper geometric, Discrete Uniform distributions – Properties - Moments – Moment Generating Function – Cumulants – Characteristic function - Recurrence relations-probability generating functions.

Unit 2
Continuous distribution - Uniform, Exponential, Gamma, Beta, Cauchy, Laplace Distributions - Properties of the distribution - Moment generating function - Characteristic function – Cumulants.

Unit 3
Normal, Lognormal distributions - Bivariate Normal distribution - Properties of the distribution - Moment generating function - Characteristic function – Cumulants
Order statistics and their distributions - Distribution function of r\(^{th}\) order statistic, range, mid-range – Simple problems.

Unit 4
Sampling Distributions - Chi-square distribution – Properties - Distribution of sample mean and variance for normal distribution - Student’s t distribution – Snedecor’s F distribution - Derivation of t, F and chi-square distributions - Relation among t, F and \(\chi^2\) distributions.

Unit 5

Books for Study:

Books for Reference:
SEMESTER II
MAJOR PAPER IV: NUMERICAL METHODS
(6 hours per week – 5 lecture-hours and 1 tutorial/seminar session per week)

UNIT 1

UNIT 2
Finite differences: Forward and backward differences – Differences of a polynomial – Relation between the Operators E, Δ, , and backward difference operator and their basic properties – Application to summation of series.

UNIT 3
Interpolation with equal intervals: Newton’s forward and backward difference formulae. Central differences: Gauss’s forward and backward difference formulae – Stirling’s, Bessel’s and Laplace- Everett’s formula – Simple problems only.

UNIT 4

UNIT 5

Books for Study:

Books for Reference:
1. Scarborough B: Numerical Mathematical Analysis, OUP.
UNIT 1

UNIT 2

UNIT 3

UNIT 4
Fourier Series: Euler's formula - Dirichlet's conditions - convergence - (statement only) - change of interval - odd and even functions - half range series - Parseval's formula - complex form of Fourier series

UNIT 5

Books For Study:

Books for Reference:
2. Widder: Integral Transforms
SEMESTER II
MAJOR PRACTICAL – II
(BASIC STATISTICS & PROBABILITY AND DISTRIBUTION)
(2 hours per week)

Working with Statistical Software Packages: SPSS or SYSTAT

1. Diagrammatic Representation – Bar Chart, Pie Diagram
2. Construction of Discrete and Continuous Frequency Tables from raw data
3. Graphical Representation - Histogram
4. Summary Statistics
5. Two way tables and plots
6. Simple correlation, Rank correlation
7. Partial and multiple correlation
8. Fitting of straight line, second degree and exponential curves
9. Simple Regression, multiple linear regression with two independent variables.
10. Fitting of Binomial, Poisson and Normal Distributions

❖ Six questions to be set. Candidates may be required to answer four questions.
❖ Max. Marks: 50 – Practical Marks: 40 Record Marks: 10
❖ Duration of exam – 3 hours
SEMESTER III
MAJOR PAPER V: STATISTICAL ESTIMATION THEORY
(6 hours per week – 5 lecture-hours and 1 tutorial/seminar session per week)

Unit 1
Point estimation – Properties of estimators – Unbiasedness – Asymptotically
Unbiased Estimator — Minimum Variance Unbiased Estimator (UMVUE) –
Uniqueness of MVUE – Concept of efficiency- Cramer-Rao inequality and its uses –
Simple problems.

Unit 2
Consistent estimators – Properties of consistent estimators – Sufficient condition for
consistency - Concept of Sufficient statistics with illustration - Sufficient Statistic and
optimal estimators — Factorization theorem – Rao-Blackwell theorem - Simple
problems.

Unit 3
Methods of estimation – Method of Maximum Likelihood – Properties of Maximum
Likelihood Estimators (without proof) – Method of moments – Method of Minimum
Variance – Method of Least Squares – Method of Minimum Chi-square - Simple
problems.

Unit 4
Interval Estimation - Concepts of Confidence Interval and Confidence Coefficient -
Confidence Intervals for the parameters of univariate and bivariate normal and
exponential distribution – Large sample confidence intervals for proportions, means,
variances and correlation coefficients.

Unit 5
Basic idea on decision theory – Loss function – Risk functions – Prior distributions –
Bayes’ Risk – Minimax principle and decision function - Simple problems. (treatment
as in Rohatgi V.K.)

Books For Study:
Statistics, McGraw Hill.
Pearson Education Asia.

Books for Reference:
SEMESTER III
MAJOR PAPER VI: REAL ANALYSIS – I
(6 hours per week – 5 lecture-hours and 1 tutorial/seminar session per week)

UNIT 1

UNIT 2
Sequence of real numbers: Limit of a sequence - Convergent sequences, Divergent sequences - Bounded sequences - Monotone sequences – Cauchy’s first and second theorem on limits – Cauchy’s general principle of convergence

UNIT 3

UNIT 4
Functions: Limit of real valued functions in one variable, continuity – types of discontinuities – algebra of continuous functions – Extreme value theorem – Intermediate value theorem – Uniformly Continuous functions

UNIT 5
Differentiability of Functions – Rolle’s theorem – Mean value theorem for derivatives – Taylor's Series expansion – application to maxima and minima

Books for Study:


Books for Reference:

SEMESTER III
ALLIED PAPER III: COMPUTER PROGRAMMING – I
(PROGRAMMING IN C)
(4 hours per week – 3 lecture-hours and 1 tutorial/seminar session per week)

UNIT 1
Introduction – Variable names – Data types and sizes – Constants – Arithmetic operators – Relational and logical operators – Increment and Decrement operators – Assignment operators and expressions – Relational and logical expressions – conditional expressions – if and switch statements – Unconditional branching – goto statement – Input/Output operations: getchar( ), getc( ), putc( ), putchar( ), scanf( ), printf( )

UNIT 2
Control loops: for, while and do – while loops – continue and break statements. Concept of functions: function declaration and arguments – scope of variable – storage classes – external, static, automatic and register types.

UNIT 3

UNIT 4
File access – Error handling – concept of data structure – list – linked list – stack and queues – operations on linked list

UNIT 5

Books For Study:

Books for Reference:
SEMESTER III
ALLIED PRACTICAL – I
(Programming in C)
(2 hours per week)

1. Program to calculate factorial.
2. Program to find sum of N natural numbers.
3. Program to reverse a number.
4. Program for string manipulations.
5. Program to find maximum and minimum in a given list.
6. Program to search for a given number in a list.
7. Program to sort a given list (Ascending and Descending order).
8. Program to read a line of text into a file and display the same.
9. Program to find roots of a quadratic equation.
10. Program to calculate arithmetic mean and standard deviation.
11. Program to calculate mean deviation about mean.
12. Program to calculate moments.
13. Program to calculate skewness and kurtosis.
14. Program to calculate correlation coefficient and regression coefficient.
15. Program for matrix addition, subtraction and multiplication.
16. Program to find transpose of a matrix.
17. Program to find determinant and inverse of a matrix.
18. Program to find roots of algebraic and transcendental equations using
   Bisection method, Regula Falsi method and Newton Raphson method.
19. Program for Lagrange’s interpolation formula.
20. Program for Simpson’s 1/3 and 3/8 rules and Weddle’s rule.

❖ Two questions to be asked with internal choice.
❖ Max. Marks: 50 — Practical Marks: 40  Record Marks: 10
❖ Duration of exam — 3 hours
SEMESTER IV
MAJOR PAPER VII: TESTING OF HYPOTHESES
(4 hours per week – 3 lecture-hours and 1 tutorial/seminar session per week)

UNIT 1

UNIT 2
Uniformly most powerful tests – definition and simple applications – Likelihood Ratio tests – Definition and LR tests for means and variance (one and two sample problem only).

UNIT 3
Test of significance: Exact and Asymptotic tests based on Normal, Student’s t, Chi-square and F-distribution for testing the means, proportions, variances and correlation coefficient – Chi-square test.

UNIT 4
Sequential tests – Need for sequential tests – Wald’s SPRT with illustrations – Approximate OC and ASN functions for tests regarding parameters of binomial and normal distributions.

UNIT 5

Books For Study:

Books for Reference:
3. Mukhopadhayay, P.(2006); Mathematical Statistics, Books and Allies(P) ltd, Kolkata
SEMESTER IV
MAJOR PAPER VIII: REAL ANALYSIS – II
(6 hours per week – 5 lecture-hours and 1 tutorial/seminar session per week)

UNIT 1

UNIT 2
Improper Integrals – their convergence and evaluation, convergence of Beta and Gamma integrals

UNIT 3

UNIT 4
Series of Functions: Convergence and uniform convergence of series of functions – Weisstrass test - Integration and differentiation of series of Functions – Abel Summability.(without proof) - Application

UNIT 5
Metric Space – definitions and examples, continuous functions on metric spaces– Open sets, closed sets and closure properties.

Books for Study:


Books for Reference :

SEMESTER IV
ALLIED PAPER IV: COMPUTER PROGRAMMING – II
(OBJECT ORIENTED PROGRAMMING IN C++)
(4 hours per week – 3 lecture-hours and 1 tutorial/seminar session per week)

UNIT 1
Object oriented programming- basic concepts-application of OOPs - Tokens, Keywords and control statements: Identifiers data types basic, user-defined and derived data types- symbolic constants -variable declaration operators in C++, Scope resolution operator - manipulations - cost operators - operator over loading and precedence - control structures.

UNIT 2
Functions : Main - prototyping - call by reference - return - in line functions - default and constant arguments - over - loading functions - friend and virtual function.

UNIT 3
Classes and Objects: Class specification - member function - nesting and private member functions - array of objects - returning objects - constant member functions - Constructors and Destructors : Parameterised - multiple constructors - default arguments - copy and dynamic constructors - destructors - Operator overloading and type conversion : Overloading unary and binary operators - friends - rules for overloading operators - type conversion.

UNIT 4
Inheritance: Defining derived classes - single inheritance - multilevel and multiple inheritance - hierarchical and hybrid inheritance - abstract classes - constructors in derived classes - Pointers : Pointers to objects - this pointer - pointers to derived classes - virtual functions and polymorphism.

UNIT 5

Books for Study

Books for Reference
SEMESTER IV
MAJOR PRACTICAL – III
(STATISTICAL ESTIMATION THEORY & TESTING OF HYPOTHESES)
(2 hours per week)

Working with Statistical Software Packages: SPSS or SYSTAT and Scientific Calculators

1. Estimation of the parameters of the discrete and continuous distribution by the method of moments and method of maximum likelihood.

2. Confidence Intervals for the parameters of Normal distribution.

3. Computation of error probabilities – Power curves

4. Large Sample Tests: Means, Variances and Proportions

5. Test based on Chi-square statistic: Population variance, Homogeneity of correlation coefficient, Bartlett’s test, and goodness of fit tests.

6. Test based on t statistic: Single men, Difference of means, Paired t test, Correlation coefficient, Regression coefficient.

7. Test based on F statistic: Equality of two population variances


❖ Six questions to be set. Candidates may be required to answer four questions.
❖ Max. Marks: 100 – Practical Marks: 80 Record Marks: 20
❖ Duration of exam – 3 hours
1. Program to find the total and average of given subject marks.
2. Program to display the electric bill of ‘n’ customers.
3. Program to reverse a number.
4. Program for string manipulations.
5. Program to search for a given number in a list.
6. Program to sort a given list (Ascending and Descending order).
7. Program to find the median.
8. Program to calculate arithmetic mean and standard deviation.
9. Program to calculate moments, skewness and kurtosis.
10. Program to calculate correlation coefficient and regression coefficient.
11. Program for matrix addition, subtraction and multiplication.
12. Program to display student detail using class.
13. Program to display bank account detail using class.
14. Program to display shopping detail using class.
15. Program to fit Binomial, Poisson and Normal distribution.
16. Program to show the virtual function using pointers.
17. Program to display employee detail using file.

- Two questions to be asked with internal choice.
- Max. Marks: 50 – Practical Marks: 40  Record Marks: 10
- Duration of exam – 3 hours
SEMESTER V
MAJOR PAPER IX: SAMPLING METHODS
(6 hours per week – 5 lecture-hours and 1 tutorial/seminar session per week)

Unit 1
Basic concept of Sample Surveys: Census and Sample Surveys- Advantages and Disadvantages - Principal steps in a sample survey – Probability and Non-probability sampling - Sampling and Non-sampling errors.

Unit 2

Unit 3
Sampling for proportions – Variances of the sample estimates - Estimation of sample size – Sample size with more than one item.

Unit 4

Unit 5
Systematic sampling – Definition - Variances of the estimated mean – Populations with linear trend – Single stage Cluster sampling with clusters of equal sizes.

Books for study:

Books for Reference:
SEMESTER V
MAJOR PAPER X: DESIGN OF EXPERIMENTS
(6 hours per week – 5 lecture-hours and 1 tutorial/seminar session per week)

Unit 1
Analysis of variance – One way classification – Two way classification – Two way classification with m observations per cell – Statistical analysis of the models.

Unit 2
Terminology in experimental designs – principles of experimentation – completely randomized design – randomized block design – Latin square design – their models, least square estimates of the parameters and analysis – Statistical analysis of experiments – Missing plot technique in the case of one or two missing observations.

Unit 3
Factorial experiments – $2^2$, $2^3$ and $3^2$ experiments only, Split plot experiments.

Unit 4
Confounding in $2^3$ factorial experiments - Total and partial confounding - multiple comparison tests - LSD and DMRT

Unit 5
Analysis of covariance – one-way layout with one concomitant variable – RBD with one concomitant variable

Books for study:

Books for Reference:
SEMESTER V
MAJOR PAPER XI: REGRESSION ANALYSIS
(4 hours per week – 3 lecture-hours and 1 tutorial/seminar session per week)

UNIT-1

UNIT-2

UNIT-3
Multiple regression model: Description of data model – Properties of least square estimators – Predicted values and standard errors – Multiple correlation coefficient - Selection of variables – Forward selection procedure – Backward elimination procedure – Stepwise method (algorithms only).

UNIT 4
Test of hypothesis on the linear model – Assumption about the explanatory variable – Testing a subset of regression coefficients equal to zero – Testing of equality of regression coefficients.

UNIT 5

Books for study:
1. S.Chatterjee and B.Price (1977): Regression Analysis by Example, John Wiley & Sons, New York. Chapter 1,2,3 and relevant portions in chapters 4,5,6,7,8,9

Books for Reference:
SEMESTER V
MAJOR PAPER XII: STOCHASTIC PROCESSES AND THEIR APPLICATIONS
(6 hours per week – 5 lecture-hours and 1 tutorial/seminar session per week)

Unit 1
Definition of Stochastic Processes – Classification of Stochastic processes according to time parameter and state space – examples of stochastic processes – definition of stationary process – stationary process with independent increments.

Unit 2

Unit 3
Classification of states of Markov chain – Stationary and limit distribution for a Markov Chain – Existence of the limiting distribution

Unit 4
Poisson Process – Simple properties – its connection to exponential distribution – Birth death process (Concept only) – Simple problems

Unit 5
Simple queuing models M/M/1, M/M/S under stationary conditions– Simple problems

Books for study:

Books for Reference:
SEMESTER V
MAJOR PAPER XIII: VISUAL BASIC
(4 hours per week – 3 lecture-hours and 1 tutorial/seminar session per week)

UNIT 1
Introduction to object oriented programming - GUI - Client-Server computing - Form, ToolBox, Project and Property windows - Forms and Controls - Creating forms and using controls - setting properties of controls - List and combo boxes - AddItem, RemoveItem and Clear methods - ListIndex and ListCount properties - Columns and Multiselect properties - TabOrder, TabIndex and TabStop properties - Predefined Dialog boxes - InputBox, MsgBox statement and MsgBox function.

UNIT 2
Programming - Structure of Visual Basic application - Events and event-driven procedures - Event-driven versus Traditional programming - Coding procedures in events - data types - Constants, variables and their scope - expressions and assignment - If and Select case structures - Do and For loops - Exit statement - DateTime, Empty and Null values - Passing arguments by value and reference - Arrays - dynamic arrays - user defined data types - Symbolic constants

UNIT 3
Objects and instances - object variables and their declaration - Scope and lifetime - Generic and specific types - control object types - New and Me keywords - objects assignment - Determining TypeOf objects - multiple instances of objects. Mouse events - MouseUp, MouseDown and MouseMove methods – Drag and Drop - DragOver, DragIcon and DragMode - concepts of Grid control

UNIT 4
Displaying and Printing - Font properties and settings - TAB and FORMAT$ - Print method - TextHeight and TextWidth methods - CurrentX and CurrentY properties - PrintForm method - Keyboard events - KeyDown, KeyPress and KeyUp events and the associated methods - File systems - Drive ListBox, Directory ListBox - ChDir statement - Path - Multiselect property - Random, Sequential and Binary access and associated functions and statements

UNIT 5
Data control and database - Table definition and Fields - Database related properties to be set Connect property - Bound controls - Record Source - DynaSet and SnapShot - record manipulation with code - Adding, deleting and editing records - Updating - UpdateRecord and UpdateControls - controlling transactions - Database objects and properties - accessing Recordset objects - MoveFirst, MoveLast, MovePrevious and MoveNext methods - Begin, Commit and Rollback transactions - accessing FoxBase files - MDI applications - creating MDI forms and Child forms - Menu and ToolBar

Books for Study:
1. Warner, Teach yourself Visual Basic 6, Tata McGraw hill
1. Create an application that does the following when a text is entered
   (a) Choose an option from each combo box for Font, Style and Size
   (b) Select Effect as Underline or Strikethrough
   (c) While performing (a) and (b) the user should be able to see the
       preview as a label.
   (d) Add two command buttons OK and EXIT
2. Design the form like a small calculator that accepts two numbers and does the
   following
   (a) Addition  (b) Subtraction  (c) Multiplication  (d) Division
   The result of operation should be displayed as label. ADD and EXIT button to
   terminate the execution.
3. Design an application that will allow you to draw on the screen when the left
   mouse button is pressed.
4. Create a form with following student details
   (i) Register Number  (ii) Name  (iii) Sex  (iv) Department  (v) Class  (vi)
   Date of birth  (vii) Create a listbox to add the items entered in the list  (viii)
   Create a text box to show no. of students entered in the list box. Do the
   following operations in the form
   (a) Add data to the list.
   (b) Remove data from the list
   (c) Clear form
   (d) Clear list
   (e) EXIT
5. Create a form with an image control and two command buttons, one to enlarge
   the image and other to shrink. Add another command button to EXIT.
6. Create a form that enables to scroll a line of text. Add command buttons to
   START, STOP and EXIT.
7. Create a form that includes shapes and add command buttons
   3 Circle  (b) Ellipse  (c) Rectangle  (d) Square  (e) Colour
   (to fill the chosen shape)
8. Create a form that uses animation to bounce a ball. Add command buttons
   START, STOP and EXIT.
9. Create a menu Edit with the commands cut, copy and paste. Add a text box
   that allows you to enter text and do the above mentioned operations.
10. Create a table in Access with the following fields
    a. Employee ID  (b) Employee Name  (c) Designation
    (d) Salary
    Retrieve this table using datacontrol and do the following operations
    (a) Add  (b) Delete  (c) Update  (d) Close

Two questions to be asked with internal choice.
Max. Marks: 100 – Practical Marks: 80  Record Marks: 20
Duration of exam – 3 hours
SEMESTER VI
MAJOR PRACTICAL V
(DESIGN OF EXPERIMENTS, REGRESSION ANALYSIS & SAMPLING METHODS)
(2 hours per week)

Working with Statistical Software Packages: SPSS or SYSTAT and Scientific Calculators

1. One way classification and Two way classification
2. Two way classification with m observations per cell
3. Completely Randomised Design
4. Randomised Block Design and R.B.D. with one or two missing values
5. Latin Square Design and L.S.D. with one or two missing values
6. $2^2$ Design, $2^3$ Design and $3^2$ Design
7. Total and Partial Confounding in $2^3$ experiments
8. Split Plot design
9. Simple Linear Regression
10. Multiple Regression
11. Simple random sampling
12. Stratified random sampling – Proportional allocation
13. Stratified random sampling – Optimum allocation
14. Systematic sampling
15. Single stage cluster sampling

Six questions to be set. Candidates may be required to answer four questions.
Max. Marks: 50 – Practical Marks: 40 – Record Marks: 10
Duration of exam – 3 hours
SEMESTER VI
MAJOR PAPER XIV: STATISTICAL QUALITY MANAGEMENT
(6 hours per week – 5 lecture-hours and 1 tutorial/seminar session per week)

Unit 1
Concept of Quality – Quality movement in India – Standardization for Quality –

Unit 2
Need for SQC in industries – process control – chance and assignable causes of
variations – concepts of specification and tolerance limits – process capability –
statistical basis for control charts – control chart for variables – X bar and R chart -
their construction and analysis.

Unit 3
Control charts for attributes – p, np, c and U charts – their construction and analysis.

Unit 4
Product control – fundamental concepts of acceptance sampling by attributes –
producer’s and consumer’s risk – concepts of AQL, LTPD, AQL and AOQL – Single
sampling plan OC, AOQ, ASN, ATI curves.

Unit 5
Double sampling plan for attributes – OC, AOQ, ASN, ATI curves – Dodge and
Romig tables – Sequential sampling plan for attributes.

Books for Study:
   Chand and Sons.

Books for Reference:
   Hill.
   Taraporewala & Sons.
SEMESTER VI
MAJOR PAPER XV: APPLIED STATISTICS
(4 hours per week – 3 lecture-hours and 1 tutorial/seminar session per week)

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, link relative method – Cyclical fluctuations – residual method only – Variate difference method

UNIT 3
Basic index numbers and their definitions – Main steps in the construction of index numbers and its uses – Fixed and Chain base index numbers - Laspeyre’s, Paasche’s, Fisher’s, Marshall – Edgeworth index numbers - Optimum tests for index numbers - Cost of living index number – Construction and uses of wholesale price index

UNIT 4

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:

Books for Reference:
2. Guide to current Indian Official Statistics. Central Statistical Organization, Govt. of India
SEMESTER VI
MAJOR PAPER XVI: OPERATIONS RESEARCH
(6 hours per week – 5 lecture-hours and 1 tutorial/seminar session per week)

Unit 1

Unit 2
Linear Programming – Graphical Solution – Simplex method including artificial variable technique – Duality problems.

Unit 3
Transportation and Assignment models – Sequencing models

Unit 4
Game Theory – Optimal Solution of two person zero sum games – Mixed strategies – Graphical solution of (2 x n) games – Solution of (m x n) games by linear programming – Dominance property.

Unit 5
PERT and CPM - network diagrams - determination of the floats and critical path - probability considerations in project scheduling.

Books for study:

Books for Reference:
SEMESTER VI
MAJOR PAPER XVII: HEALTH STATISTICS AND POPULATION DYNAMICS

(6 hours per week – 5 lecture-hours and 1 tutorial/seminar session per week)

Unit 1
Health statistics: Introduction, utilization of basic data, sources of health statistics, problems in the collection of sickness data, measurement of sickness, hospital statistics and the international classification of diseases – sources of demographic data in India: census, vital events, registration, survey, extent of under registration

Unit 2

Unit 3

Unit 4
Force of mortality – Gompertz and Makeham law – Abridged life table – need and uses – construction by Reed – Merril – King and Graville methods

Unit 5

Books for study

Books for Reference
SEMESTER VI
MAJOR PRACTICAL VII
(S.Q.M, APPLIED STATISTICS & HEALTH STATISTICS)
(2 hours per week)

Working with Statistical Software Packages: SPSS or SYSTAT and Scientific Calculators

1. $\bar{X}$ and R chart
2. p chart, np chart
3. c chart
4. Single Sampling Plan
5. Double Sampling Plan
6. Time series: Curve fitting by principle of least squares – straight line, Exponential and Logistic curves.
7. Seasonal fluctuations: Ratio to trend method, Ratio to moving average method and Link relative method.
8. Index numbers: Calculation of indices using Laspeyre’s, Paasche’s, Marshall-Edgeworth, Bowley’s and Fisher’s formula.
10. Crude specific and Standardised death rates
16. Construction of life tables
17. Crude specific and general fertility rates

Six questions to be set. Candidates may be required to answer four questions.
Max. Marks: 50 – Practical Marks: 40 Record Marks: 10
Duration of exam – 3 hours
SEMESTER VI
ELECTIVE 1: ACTUARIAL STATISTICS
(6 hours per week – 5 lecture-hours and 1 tutorial/seminar session per week)

Unit 1
Elements of compound interest (nominal and effective rates of interest, annuities certain, present values, accumulated amounts, deferred annuities) – the functions included in compound interest – tables and their uses

Unit 2
Redemption of loans – sinking funds – the average yield on the life fund of an assurance office

Unit 3
The mortality table – select rate – general natures – construction – characteristics and uses of mortality tables

Unit 4

Unit 5
Life office valuations – general principles – policy values – retrospective and prospective methods of valuation of liabilities

Books for Study:
1. Federation of Insurance Institutes Study Courses – Mathematical Basis of Life Assurances F1, 2

Books for reference:
SEMESTER VI
ELECTIVE 2: INDUSTRIAL STATISTICS
(6 hours per week – 5 lecture-hours and 1 tutorial/seminar session per week)

Unit 1
Inventory planning: Concept of planned inventory policies – Deterministic models – Policy when inventory levels are reviewed continuously and demands occur uniformly with and without shortage costs – Economic order quantity.

Unit 2
Policy for production planning when inventory levels are reviewed periodically – Stochastic models – Single period model with no set up cost having zero or non-zero initial stock {(s,S) policy} – Solving special cases using computer packages.

Unit 3
Forecasting: Concept of forecasting and its applications in manufacturing and non-manufacturing industrial situations – Different methods of forecasting including average, last value, weighted average(exponential smoothing) – Forecasting in presence of linear trends using least square methods – Forecasting in presence of seasonal effects – Solving special cases using computer package.

Unit 4
Reliability: Definitions and relationships between survival function, hazard function, hazard rate of a non-negative random variable – Parametric distributions: Weibull, Gamma, Lognormal and Exponential as life time distributions - Concept of aging, IFR, IFRA classes of distributions and their dual.

Unit 5
Coherent system as binary function: Minimal cut and path sets(vectors) – Representation of structure function of series, parallel and k out of n : G systems of independent components – Minimal cut and path structure functions – Dual of a coherent structure – Derivation of reliabilities of above structures.

Books for study:

Books for Reference:
SEMESTER VI
ELECTIVE 3: APPLIED DECISION MAKING
(6 hours per week – 5 lecture-hours and 1 tutorial/seminar session per week)

Unit 1
Decision Problem: Goals and objectives – Conflict between goals – Possible solutions – Constraints – Feasible solutions – Objective function – Costs and benefits, notions and criteria for optimality.

Unit 2
Steps in decision-making: Determining objective(s), identifying alternative feasible solutions, determining (expected) costs and benefits associated with a feasible solution, developing a measure of effectiveness, finding the optimal solution – Sensitivity analysis and post-optimality problems – controlling a solution.

Unit 3

Unit 4
Sequential decisions – Decision trees – Informal analysis of decision trees – Cutting decision trees – Decision-making using expected money value and utility – Expected profit with perfect information – Value of sample information – Expected net gain due to sampling

Unit 5
Decision problems in marketing – Brand-loyalty model – Brand-share model – Pricing problem – Competitive bidding – Allocation of advertising funds
Decision problems in finance – Investment decision trees – Risk analysis – Portfolio selection – Dividend policy

Books for study:


Books for Reference:

SEMESTER VI
ELECTIVE 4: JAVA PROGRAMMING
(6 hours per week – 5 lecture-hours and 1 tutorial/seminar session per week)

UNIT I

Introduction to JAVA : JAVA features, Java program structure – Java tokens –Java Literals –Java Datatypes-Type Casting Operators –Arrays, Multi Dimensional array – Control statements.

UNIT II

Classes-Objects-Methods-method Overloading –Array of Objects .
Inheritance: Types-Method Overriding, Abstract classes-Interfaces, packages

UNIT III

Overviews of Applets: Applet basics – Applets life cycle-creating an executable Applet in Html file AWT: working with graphics – working with frame window-
Using Awt Controls : label – Buttons – Checkbox- Check Box Groups- Choice control.-text field-Multi Threading - Creating Thread – Extending Threads .

UNIT IV

Event handling : Event classes – Event Listener Interfaces-handling Mouse Events-

UNIT V

Java Swing – Introduction – Advantages – Swing controls. Introduction to servlets –
Overview of Java Beans

Books for study:


REFERENCE


2. C.Xavier: Programming with Java2 , Scitech Publications Ltd.
SEMESTER VI
ELECTIVE 5: DATA BASE MANAGEMENT SYSTEM
(6 hours per week – 5 lecture-hours and 1 tutorial/seminar session per week)

UNIT- I

UNIT – II
Entity relationship model: Mapping constraints – Primary Keys – Foreign Keys – Structural Constraints. – ER notations - ER model examples – Enhanced Entity Relationship Model: EER Concepts like Generalization, Specialization, Union, Category, Disjoint, Overlapping etc. EER model examples

UNIT- III

UNIT- IV
SQL – Basics of SQL –DDL – DML – DCL – TCL Commands in detail with examples

UNIT- V

Books for study:

Reference Books:
1. Ramez Elmasri and B. Navathe, Fundamentals of Database Systems (Chapters 1, 2, 3, 4.1, 7, 8, 9, 14), 3/e, Addison Wesley.
SEMESTER VI
ELECTIVE 6: BIOINFORMATICS
(6 hours per week – 5 lecture-hours and 1 tutorial/seminar session per week)

Unit 1
Introduction – Development of Bioinformatics - Biological concepts of Bioinformatics
- DNA- The Blue print of life – Chromosomes and its organization - Genetic Code –
Genes Expression – RNA- Rice- Human – Genome.

Unit 2
Data representation – Data file formats – Data Retrieval Sysatems - Biological data
base – Structural data bases – Genome databases – Primary and Secondary data bases.

Unit 3
Sequence manipulations – Sequence files – Sequence editing – Sequence symbols.

Unit 4
Pairwise alignment – Local and global alignment - Multiple sequence Alignment-
Phylogenetic Analysis – Gene Finding.

Unit 5
Data base searches – BLAST, FASTA –Elementary concepts of data mixing.

Books for study:

Achchagam.
6. Arthur M. Lesh: Introduction to Bioinformatics
SEMESTER VI
ELECTIVE 7: STATISTICAL GENETICS
(6 hours per week – 5 lecture-hours and 1 tutorial/seminar session per week)

Unit 1
Statistics Genetics: Cells, Chromosomes, Gametes, Genes and Gene frequency, Mendel’s laws- Single locus with two alleles – Hardy-Weinberg equilibrium – A-B-O bloodgroup system, Calculation of probabilities of offspring bloodgroup for given parental blood group – Chance of incompatibility.

Unit 2
Definition of ED50, ED90 etc.- Simple method of estimation of the above. Data: Dose levels (Z,I), number of individuals exposed (n,I), number responding (r,I). Simple regression of probit on log dose to estimate parameters of tolerance distribution.

Unit 3
Introduction to logistic regression with binary response and one independent variables (continuous) - Exponential and logistic models of population growth, solving the following differential equations:
\[ \frac{dN_t}{dt} = kN_t, \quad \frac{dN_t}{dt} = aN_t(k-N_t). \]
Fitting the above growth models to data by linearization and regression.

Unit 4

Unit 5
Study of exponential and Weibull distributions as models for survivorship data. Corresponding hazard functions and interpretation of their shapes. Applications to environmental data.

Books for Study:

Books for References:
Guidelines for the Project work:

1. A project work shall be normally offered in the third year (sixth semester).
2. A project work shall be assessed for a maximum of 100 marks. The assessment will be based on the project report, presentation and viva-voce – ONLY INTERNAL EVALUATION.
3. A project may be undertaken by a group of students and the maximum number of students in a team shall not exceed five.
4. A project work shall be supervised by a faculty member assigned by the Head of the Department.
5. There shall be an internal examiner for the evaluation of the project work.
6. A project work should encourage a student to interact with the end user.
7. A project work should be chosen such that there is enough scope to apply and demonstrate the statistical techniques learnt in the course.
8. The students should submit a report above their project work before the last working day of the concerned semester. Even if a team of students undertake the same project, the project report submitted by each member of the team should be separate.
9. A project work report shall clearly state the problem addressed, the methodology adopted, the assumptions and the hypotheses formulated, any previous references to the study undertaken, statistical analyses performed and the broad conclusion drawn.