MAJOR PAPER I
DESCRIPTIVE STATISTICS (STMA)

Credits : 4                                                                                      (5 hrs/week)

Objective : To introduce basic statistical concepts.

UNIT 1:
Nature and scope of statistical methods and their limitations-
Preparation of questionnaire and schedule- primary and secondary sources of
data-nominal, ordinal, ratio and interval scale.

UNIT 2:
Presentation by tables and diagrams: construction of tables with one,
two and three factors of classifications-diagrammatic representations,
frequency distributions for continuous and discrete data, graphical
representation of a frequency distribution by histogram and frequency
polygon, cumulative frequency distributions (inclusive and exclusive
methods) and ogives.

UNIT 3:
Measures of location, dispersion, moments and measure of skewness and
kurtosis for both grouped and ungrouped data.

UNIT 4:
Principle of least squares - fitting of first, second degree and exponential
curves. Correlation: scatter diagram, correlation coefficient and its
properties. Spearman’s rank correlation. Regression coefficients and its
properties, regression equations.

UNIT 5:
Fundamental set of frequencies, consistency of data, conditions for
consistency, contingency table, association of attributes and various
measures of associations.
BOOKS FOR STUDY:


BOOKS FOR REFERENCE:

Objective : To introduce the basic concepts in probability.

UNIT 1:
Random experiment, sample point, sample space, Classical and relative frequency approach to probability, Axiomatic approach to probability. Addition theorem of probability-simple problems. Boole’s inequality.

UNIT 2:

UNIT 3:

UNIT 4:
Mathematical Expectation- addition theorem and multiplication theorem - Covariance- conditional expectation, conditional variance – simple problems.

UNIT 5:
BOOKS FOR STUDY:


BOOKS FOR REFERENCE:

MAJOR PRACTICAL I
BASED ON MAJOR PAPERS – I & II (STA2)

Credits : 3                                                                 (3 hrs/week)

Objective : To develop computing skills in solving statistical problems.

NOTE: Record 10 Marks, Practical Examination Marks 50.
Five questions are to be set without omitting any unit.
Candidates are to answer any three questions.

1. Construction of univariate and bivariate distributions with samples of
size not exceeding 200.
2. Diagrammatic and graphical representation of data and frequency
distribution.
4. Measure of location and dispersion. (Absolute and relative)
5. Curve fitting by the method of least squares.
   (i) \( y=ax + b \)
   (ii) \( y=ax^2 + bx + c \)
   (iii) \( y=ae^{bx} \)
6. Computation of correlation coefficient and regression lines for raw
and grouped data. Rank correlation coefficient.
7. Construction of contingency table and testing the consistency of data.
8. Computation of various measures of associations of attributes.
9. Rank of a matrix of order \( p \times q \) \( (p, q<4)\).
10. Inverse of a non singular matrix – by
    i. Sweepout method
    ii. Cayley Hamilton theorem
11. Solution to system of linear equations.
12. Determination of characteristic roots and characteristic vectors of
    second and third order square matrices.
Objective: To introduce various probability distributions and their applications.

UNIT 1:
Standard univariate distributions - Point distribution, Uniform, Binomial, Poisson, Geometric distribution and their properties- moment generating function, characteristic function for the above distributions. Hyper geometric, Multinomial, Negative Binomial – mean and variance only.

UNIT 2:
Standard continuous distributions - Uniform, Exponential, Gamma, Beta, Laplace, Pareto, Weibull, Cauchy distributions and their properties - moment generating function and characteristic function for the above distributions.

UNIT 3:

UNIT 4:
Order statistics – distribution of first, n^{th} and i^{th} order statistics – joint distribution of r^{th} and s^{th} order statistics - distribution of median and range – simple problems

UNIT 5:
Convergence in probability - Weak law of large numbers – convergence of distributions – Binomial to Poisson – Demoivre’s – Laplace theorem – Central limit theorem due to Lindberg – Levy’s CLT for i.i.d random variables.
BOOKS FOR STUDY:


BOOKS FOR REFERENCE:

ALLIED II – PAPER I
PROGRAMMING IN C++ (YPGAA)

Credits : 4
(5 hrs/week)

Objective : To impart programming skills using C++.

UNIT 1:
   Character set – Tokens - Keywords – Variables (identifiers) - Declaration
   and initialization of variables – Reference variables – Constants (string, numeric,
   character and symbolic constants). Arithmetic operators – Relational operator –
   Logical operator – Assignment operator – Increment and decrement operators –
   mathematical functions.

UNIT 2:
   If statement – if…else statement – switch statement – while statement –
   do…while statement – for statement – break statement – continue statement
   – simple programs. Arrays – One dimensional arrays – Two dimensional
   arrays – strings – simple problems. Defining a function – Advantages of
   Structures.

UNIT 3:
   Object-Oriented programming – advantages of OOP over procedure
   oriented programming – OOP language. What is C++? – features and
   applications of C++ - Source code and object code – C++ compilers –
   Features of iostream.h – Comments – Input/Output using cin/cout, gets/puts ,
   getchar/putchar and getc/putc.

UNIT 4:
   Class- General form of a class declaration – Creating objects –
   Accessing class members – Defining member functions outside/inside the
   class – Arrays within a class – Memory allocation for objects – Arrays of
   objects. Constructors and Destructors.

UNIT-5:
   Operator Overloading and Type conversions . Inheritance - Single
   Inheritance - Multilevel Inheritance - Multiple Inheritance - Hierarchical
   Inheritance - Hybrid Inheritance.
NOTE: Students should be trained in writing Statistical Programs (mean, Median, variance, skewness, kurtosis, correlation, regression – only for Raw data. Matrix manipulation – addition, multiplication, trace and transpose). Programs can be asked in section C from the above list.

BOOKS FOR STUDY:


BOOK FOR REFERENCE:

MAJOR PAPER IV
ESTIMATION THEORY (STMAD)

Credits : 4 (5 hrs/week)

Objective : To equip the students with various methods of estimation.

UNIT 1:
Sampling distributions – distributions of mean and variance from normal population. Sampling distributions of Chi-Square, t and F statistics.

UNIT 2:

UNIT 3:

UNIT 4:
Methods of estimation: Method of moments, Method of Maximum Likelihood, Method of Minimum chi square, Method of modified minimum chi-square, Method of minimum variance – properties of estimators obtained by these methods - simple problems.

UNIT 5:
Interval Estimation – Confidence Interval for proportions, mean(s), variance and variance ratio based on chi square, student’s t, F and Normal distributions. Tests of significance: concepts, tests based on normal, t, F and Chi Square.
BOOKS FOR STUDY:


BOOKS FOR REFERENCE:

MAJOR PRACTICAL II
BASED ON MAJOR PAPERS - III & IV (STA4)

Credits : 3 (3 hrs/week)

Objective : To give hands on training for inferential problems.

NOTE: Record 10 Marks, Practical Examination 50 Marks.
Five questions are to be set without omitting any unit.
Candidates are to answer any three questions.

1. Fitting of Binomial, Poisson, Negative Binomial and Normal Distributions.
2. Drawing random samples of size not exceeding 25 from Binomial, Poisson, Uniform, Cauchy, Normal and Exponential distribution with known mean and variance using random number tables.
5. Estimation of parameters by method of minimum chi-square (discrete and continuous distributions).
7. Confidence intervals based on Normal, t, F and chi-square statistic.
8. Asymptotic and exact tests of significance with regard to population proportion(s), mean(s), variance, ratio of variances and coefficient of correlation, regression coefficients.
9. Independence tests by contingency tables of order p x q (p, q=5)
ALLIED II – PAPER II
NUMERICAL METHODS (YNSSA)

Credits : 4 (5 hrs/week)

Objective : To train the students with the basic concepts of numerical methods.

UNIT 1:
Finite differences – forward and backward differences operators E and delta, and their basic properties – interpolation with equal intervals – Newton’s forward and backward differences formulae - simple problems.

UNIT 2:
Interpolation with unequal intervals – divided differences and their properties – Newton’s divided differences formula – Lagrange’s formula- simple problems.

UNIT 3:
Central difference interpolation formula – Gauss forward and backward differences formulae – Sterling’s, Bessel’s, Everett’s central difference formula.

UNIT 4:

UNIT 5:
Numerical differentiation – Numerical differentiation up to 2\textsuperscript{nd} order only - simple problems. Numerical integration – trapezoidal rule – Simpson’s one third and three eighth rule – Weddle’s rule - simple problems.
BOOK FOR STUDY:


BOOKS FOR REFERENCE:

ALLIED II – PRACTICAL
(Based on Allied II papers I and II) (YPGA4)

Credits : 2 (3 hrs/week)

Objective : To train the students to have an exposure in writing a programming language.

NOTE : Record 10 Marks, Practical Examination 40 marks
Duration of the Examination: Three hours.
Two questions have to be set with internal choice, one from each unit.
Each carries 20 marks.

Write and test run the program in C++ for the following problems.

UNIT : I
1. Find the Mean and Median of ungrouped data.
2. Find the Mean and Standard Deviation of ungrouped data.
3. Form the frequency distribution with k classes given N observations with k known.
4. Find the Skewness and Kurtosis of an empirical distribution.
5. Regression and correlation coefficients.
6. Counting number of words in a given sequence, palindrome.

UNIT : 2
1. Matrix addition and subtractions.
2. Matrix multiplication.
3. Inverse of a square matrix and solution of simultaneous equations.
4. Fitting of Binomial and Poisson distribution for the given frequency distribution and test the goodness of fit.
5. Single and two sample ‘t’ test, paired ‘t’ test given a set of n observations.
6. F-test for testing the equality of two population variances given a set of n observations.
7. Numerical integration by Trapezoidal, Simpson’s 1/3 and 3/8th rule
   Solution of polynomial equations by Newton Raphson method.
Objective: To explain the parametric and non-parametric tests with illustrative examples.

UNIT 1:

UNIT 2:
Uniformly most powerful tests – Likelihood ratio tests – Tests based on t, Chi-Square, F and normal distributions.

UNIT 3:
Sequential Probability Ratio Test – Definition and properties of SPRT, OC and ASN for Binomial, Poisson & Normal distributions – simple problems.

UNIT 4:
Non-Parametric tests – sign test, Wilcoxon signed rank test, Median test, Mann-Whitney U test, Run test, Kolmogorov-Smirnov one sample and two sample tests and Kruskal-Wallis test.

UNIT 5:
Basic ideas on decision theory – Loss functions – Risk functions– Prior and posterior distributions – Baye’s Risk - simple problems based on Bayes’ estimation.
BOOKS FOR STUDY:


BOOKS FOR REFERENCE:

5. Surendran and Saxena : Statistical inference.
Objective: To enable students to understand the principles of design and analysis of experiments.

UNIT 1:
Principles of Experimentation: Replication, Randomization and Local Control; Size of experimental unit; Methods of determination of experimental units – Maximum curvature methods - Fairfield Smith’s variance law.

UNIT 2:
Analysis of Variance – one-way, two-way classification (without interaction); Multiple range tests – Newman-Keuls test, Least significance difference test, Duncan’s multiple range test & Tukey’s test; Transformations – Square root, angular and log transformations.

UNIT 3:
Completely Randomized design (CRD) and its analysis; Randomized Block Design (RBD) and its analysis; analysis of RBD with more than one but equal number of observations per cell; Latin Square Design (LSD) and its analysis.

UNIT 4:
Missing plot technique – Meaning, Least square method of estimating (one /two) missing observations in RBD and LSD; Analysis of covariance technique in CRD and in RBD with least square estimates only.

UNIT 5:
Factorial experiments – Definition of $2^2$, $2^3$ and $3^2$ factorial experiments and their analysis; Principles of confounding – Partial and Complete confounding in $2^3$ design; Split plot design in RBD layout and its analysis.
BOOKS FOR STUDY:


BOOKS FOR REFERENCE:

Objective: To discuss the applications of statistical tools in business and economics.

UNIT 1:

UNIT 2:

UNIT 3:
Index Numbers – uses, classification of index numbers – Problems in the construction of index numbers – Methods of constructing index numbers – Unweighted index numbers – weighted index numbers, quantity index numbers and cost of living index numbers.
Fixed and chain base index numbers- base shifting, splicing and deflating of index numbers – Optimum test for index numbers – Time reversal test – factor reversal test.

UNIT 4:
Business forecasting – role of forecasting in Business – steps in forecasting – methods of forecasting – business barometers, extrapolation, regression analysis, econometric models, forecasting by the use of time series analysis, opinion polling, causal models, exponential smoothing, survey method. Box-Jenkins methodology – steps only.

UNIT 5:
**BOOKS FOR STUDY:**


**BOOKS FOR REFERENCE:**

4. Website-www.mospi.nic.in
Objective: To train the students to have exposure for programming language.

UNIT 1:
Introduction to object oriented programming – GUI – Client-Server computing (Introduction only). Form, Tool Box, Project and Property windows – Forms and Controls - Creating forms and using controls – setting properties of controls – List and combo boxes – Add item, Remove Item and Clear methods – List Index and List Count properties – Columns and Multiselect properties – Tab Order, Tab Index and Tab Stop properties – Predefined Dialog boxes – Input Box, MsgBox statement and MsgBox function.

UNIT 2:

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 Type Of objects – multiple instances of objects.
MDI applications – creating MDI forms and Child forms – Menu and Toolbar.

UNIT 4:
UNIT5:
Programs for simple statistical problems: Mean, Variance, Correlation Coefficient and Regression Coefficients – Evaluating discrete probabilities – Finding minimum, maximum, range and median of discrete values, sorting and binary search algorithms – Lagrange’s interpolation.

BOOKS FOR STUDY:


BOOK FOR REFERENCE:

CORE ELECTIVE- 1
DEMOGRAPHY AND ACTUARIAL STATISTICS (ESTA)

Credits : 5  
(5 hrs/week)

Objective : To familiarize students with the concepts of Vital statistics.  
To enable students to understand the Actuarial concepts.

UNIT 1:  

UNIT 2:  

UNIT 3:  
Elements of compound interest (nominal and effective rate of interest; annuities certain; present values; accumulated amounts; deferred annuities). The functions included in compound interest and their uses. Redemption of Loans, Sinking Funds. The average Yield on the Life Fund of an insurance office. Simple Problems.

UNIT 4:  
Premiums; general principles, natural premiums, office premiums, loading for expenses with and without profit premiums, adequacy of premiums, relative consistency. Simple Problems.

UNIT 5:  
Policy values, retrospective and prospective methods; Surplus – sources of surplus, principle methods of surplus.

NOTE: Numerical problems can be asked in the question paper.
BOOKS FOR STUDY:


BOOKS FOR REFERENCE:

Objective: To impart programming skills using VB.

NOTE:
Maximum 50 marks
Internal marks: 20 & External Marks: 30
Duration of Examination: Three Hours.

Candidates to answer any TWO questions with internal choice
All questions carry equal marks.

(Outline of the exercises to be carried out)

2. Correlation and regression.
3. Small sample tests of significance.
4. Drawing a random sample from uniform, exponential and cauchy population
5. Simple database based programs: Names and Telephone Numbers, Students Marks, Electricity Bill, Pay-Slip
6. Finding minimum, maximum, range and median for discrete values.
7. Lagrange’s interpolation.
8. Binary search algorithms.
Objective: To introduce various sampling Designs and develop problem solving Skills for comparing the efficiencies of different sampling designs.

UNIT 1:

UNIT 2:
Sampling from finite population – simple random sampling with and without replacement – unbiased estimate of the mean, variance of the estimate of the mean, finite population correction – estimation of standard error from a sample – determination of sample size

UNIT 3:
Stratified random sampling – properties of the estimates - unbiased estimates of the mean and variance of the estimates of the mean-optimum and proportional allocations – relative precision of a stratified sampling and simple random sampling – estimation of gain in precision in stratified sampling.

UNIT 4:
Systematic sampling – estimate of mean and variance of the estimated mean – comparison of simple and stratified with systematic random sampling

UNIT 5:
Ratio estimators: Definition – bias – variance of the ratio estimator – Comparison with mean per unit. Difference estimator – Regression estimator: Comparison with mean per unit. PPS sampling – concept only – cumulative method and Lahiri method.
**BOOKS FOR STUDY:**


**BOOKS FOR REFERENCE:**

Credits : 4

Objective : To provide the basic knowledge of quality control techniques and reliability concepts.

UNIT 1:
Need for Statistical Quality Control techniques in Industry –

UNIT 2:
Control chart for variables: $\bar{X}$ chart – R chart – purpose, construction and their interpretation.
Control chart for attributes: p chart – np chart – c chart – Construction and their interpretation.

UNIT 3:
Acceptance sampling plans for attributes: Producer’s risk and consumer’s risk – concepts of AQL, LTPD, AOQ, AOQL, ATI and ASN – single sampling plan and double sampling plans – OC, ASN, AOQ, ATI curves for single and double sampling plans.

UNIT 4:
Variable sampling plans- Sigma known and sigma unknown - determination of n and k for one-sided specification – OC curve.
Sequential sampling plan – Sequential Probability Ratio Test – OC, ASN function- working rule – binomial population only.

UNIT 5:
**BOOKS FOR STUDY:**


**BOOKS FOR REFERENCE:**

Credits : 4 (5 hrs/week)

Objective : To introduce regression models applicable to real life situation.

UNIT 1:
Partial and multiple correlation coefficients-plane of regression-properties of residuals- relationship among simple, multiple and partial correlation coefficients.

UNIT 2:

UNIT 3:

UNIT 4:

UNIT 5:
Inference on GLM: Test of hypothesis on the linear model – Assumption about the explanatory variable – testing a subset of regression coefficient equals to zero – testing of equality of regression coefficients.
**BOOKS FOR STUDY:**


**BOOKS FOR REFERENCE:**

OBJECTIVES:
Training the students to use optimization techniques for solving decision making problems.

UNIT 1:
Introduction to OR- Linear programming problem – Formulation of LPP – Solving the LPP by graphical method – Solving the LPP by simplex method (degeneracy), Big M & two phase methods - Duality – Concept only - Simple problems.

UNIT 2:
Transportation problem - obtaining initial, feasible and optimal solution by MODI method, degeneracy, Unbalanced transportation problem; Assignment problem - unbalanced assignment problem – Traveling salesman problem.

UNIT 3:
Sequencing - ‘n’ jobs through 2 machines, ‘n’ jobs through 3 machines, ‘n’ jobs on m machines, two jobs on ‘m’ machines.
Game Theory – Two person zero sum games, the maximin & minimax principle, Mixed strategies, Graphical solution of 2xn and nx2 games, Dominance property.

UNIT 4:

UNIT 5:
Replacement – Introduction – Replacement of equipment/asset that deteriorates gradually – Replacement policy when value of money does not change with time – Replacement policy when value of money changes with time – Replacement of equipment that fails suddenly – Individual replacement policy – group replacement policy.
BOOKS FOR STUDY:


BOOKS FOR REFERENCE:

CORE ELECTIVE II
PRACTICAL USING SPSS (ESTB)

Credits : 5
(5 hrs/week)

Objective : To orient the students to do data analysis using SPSS.

1. Diagrams – Simple bar, Pie diagram, Multiple bar diagram (clustered), Subdivided (stacked bar).
2. Frequency distribution – Univariate (categorical data, quantitative data), Bivariate (cross tabulation).
3. Graphs – Histogram, Box-Whiskers plot.
5. Harmonic mean and geometric mean.
6. Correlation coefficient and scatter diagram – both Karl-Pearson’s and spearman’s rank correlation.
7. Regression equations.
8. One sample t-test.
10. Two independent samples t-test.
11. Chi-square goodness of fit (one way Chi-square test).
12. Chi-square test for independent samples (two way Chi-square test).
13. ANOVA – one way and two way.
15. Wilcoxon signed rank test.

BOOKS FOR STUDY:

BOOKS FOR REFERENCE:
CORE ELECTIVE III  
STOCHASTIC PROCESSES  (ESTC)  

Credits : 5  
(5 hrs/week) 

Objective : To expose the students to the applicability of various aspects of Stochastic Processes. 

UNIT 1:  
Definition of stochastic process, classification of stochastic process according to time parameter space and state space-examples of stochastic process

UNIT 2:  
Markov chain – definitions and examples – higher transition probabilities – Chapman – Kolmogorov equations(discrete) – classification of states of Markov Chains, Stationary distributions (concept and applications only), examples of Markov Chains

UNIT 3:  

UNIT 4:  
Renewal process: Definition and examples – Renewal funcion, renewal density and renewal equation.

UNIT 5:  
Simple queuing models M/M/1, M/M/s queuing systems (finite and infinite) steady state solution-simple problems with finite and infinite capacities.
BOOK FOR STUDY:


BOOKS FOR REFERENCE:

MAJOR PRACTICAL - IV
(Calculator based) (STA6)

Credits: 2
(3 hrs/week)

Objective: To enhance computing skills.

NOTE:
Maximum: 50 marks
Internal marks: 20 & External Marks: 30
Duration of Examination: Three Hours.
Five Questions are to be set without omitting any topic.
Candidates are to answer any three questions without omitting any topic.
All questions carry equal marks.
(Outline of the exercises to be carried out)

UNIT 1:
Testing Statistical Hypotheses:
1. Type I and Type II error calculations – Binomial, Poisson & Normal distributions.
2. Most Powerful tests – Bernoulli, Poisson & Normal distributions.

UNIT 2:
Design of Experiments:
1. ANOVA – one & two way classification,
2. Analysis of CRD, RBD, LSD, their efficiencies, Missing plot techniques in RBD & LSD.
3. Analysis of covariance - one-way classification with one concomitant variable.
4. Analysis of factorial experiments – $2^2$, $2^3$, with and without confounding and $3^2$ factorial experiments.
5. Analysis of Split plot design in RBD layout
UNIT 3:
Applied Statistics:
1. Fitting of trend polynomials by method of least squares – linear, quadratic, exponential.
3. Measurement of seasonal variation – simple average, ratio to trend, ratio to moving average and link relative methods.
5. Construction of Index numbers - Laspeyre’s, Paasche’s, Bowley’s, Fisher’s and Marshall-Edgeworth index numbers
6. Fixed and Chain base index numbers, Cost of living numbers.
7. Base shifting, splicing and deflating of index numbers.

UNIT 4:
Statistical quality control:
1. Control charts for attributes and variables-x-bar, R-chart, p, np, and C-charts.
2. OC, AOQ, ATI curves for single sampling plan.

Regression Analysis:
1. Multiple and Partial correlation coefficient.
2. Simple Linear regression model.

UNIT 5:
Sampling:
1. Simple random sampling with and without replacement-estimation of population mean and variance
2. Stratified random sampling-estimation of mean and variance under proportional allocation and optimum allocation, gain due to stratification
4. Ratio estimation-estimation for population mean and total based on simple random sampling only.
5. Regression method of estimation-estimation for population mean and total (simple random sampling only)
6. Probability proportional to size sampling-cumulative total method, Lahiri’s method.
7. Sample size determination.

Note: Question paper to be set for 100 marks (scaled down to 30)
Objective: To introduce the basic statistical concepts.

UNIT 1:
Concept of sample space – Events, definition of Probability (classical, statistical & axiomatic) – addition and multiplication law of probability – independence – conditional probability – Bayes’ theorem - simple problems

UNIT 2:

UNIT 3:
Mathematical Expectation – addition and multiplication theorem – moments – Moment generating function – Characteristic function – Cumulants – their properties. Chebychev’s inequality - simple problems

UNIT 4:
Correlation and regression – Rank correlation coefficient - simple problems.

UNIT 5:
Standard Distributions – Binomial, Poisson, Normal and Uniform distributions – Gamma and Beta distributions. Interrelationship between distributions.
BOOK FOR STUDY:


BOOKS FOR REFERENCE:

Objective: To introduce the basics concepts of statistical inference.

UNIT 1:
Exact sampling distribution: Chi square – definition – derivation of pdf, mgf, additive property. $t$ and $F$ – definition – derivation of pdf’s – mean and variance. Interrelationship between $t$, $F$ and chi-square.

UNIT 2:

UNIT 3:
Methods of estimation – maximum likelihood, moments. Interval estimation – Confidence Interval for proportion(s), mean(s), variance and ratio of variance based on Normal, $t$, Chi-square and $F$.

UNIT 4:
Test of significance – Standard Error – Large sample tests. Exact test based on $t$, Chi-square and $F$ distribution with respect to population mean, proportion, variance and correlation coefficient. Theory of attributes – Test of independence of attributes based on contingency table – Goodness of fit tests based on Chi-square.

UNIT 5:
Test of hypothesis: Type I and Type II errors – power of test – Neymann Pearson Lemma – most powerful test – (statement and result only) - simple problems.
**BOOK FOR STUDY:**


**BOOKS FOR REFERENCE:**

Objective: To familiarize the students with applications of statistical tools.

NOTE: Use of scientific calculators may be permitted for Mathematical Statistics practical examination. Statistical and Mathematical tables are to be provided to the students at the examination hall.

Record of practical: 10 marks

Practical Exam: 40 Marks

1. Construction of univariate and bivariate distributions with samples of size not exceeding 200.
2. Diagrammatic and graphical representation of data and frequency distribution.
4. Measure of location and dispersion (absolute and relative).
5. Fitting of Binomial, Poisson and Normal distributions and tests of goodness of fit.
6. Curve fitting by the method of least squares.
   (i) \( y = ax + b \) (ii) \( y = ax^2 + bx + c \) (iii) \( y = ae^{bx} \)
7. Computation of correlation coefficient and regression lines for raw and grouped data. Rank correlation coefficient.
8. Asymptotic and exact tests of significance with regard to population proportion(s), mean(s), variance, ratio of variances and coefficient of correlation.
9. Confidence Interval based on Normal, t, F and Chi-square statistic.
ALLIED II – PAPER I
STATISTICAL METHODS AND THEIR APPLICATIONS – I
(YSMAA)

Credits : 4 (5 hrs/week)

Objective : To introduce the basic concepts in Statistics.

UNIT 1:
Nature and scope of statistical methods and their limitations – Classification, tabulation and diagrammatic representation of various type of statistical data – Frequency curve and Ogives – graphical determination of percentiles, quantiles and their uses, Lorenz curve.

UNIT 2:
Measures of location – arithmetic mean, median, mode, geometric mean, harmonic mean and their properties – merits and demerits - simple problems.

UNIT 3:
Measures of dispersion-Range, mean deviation, quartile deviation, standard deviation, coefficient of variation, skewness and kurtosis - simple problems.

UNIT 4:
Probability of an event – addition and multiplication theorem for two events – Independence of events – conditional probability – Bayes’ theorem - simple problems.

UNIT 5:
BOOKS FOR STUDY:


BOOKS FOR REFERENCE:

Credits : 4

Objective : The emphasis is solely upon the applicational understanding and practice of statistical methods.

UNIT 1:
Correlation – Scatter diagram – Rank correlation coefficient – Regression lines – linear prediction – Curve fitting by the method of least squares \( y=ax+b, y=ax^2+bx+c, y=ae^{bx} \) - simple problems.

UNIT 2:

UNIT 3:
Test of significance based on t, Chi-square and F distributions with respect to mean, variance and correlation coefficient – Test of independence in contingency table – Test of goodness of fit (Binomial, Poisson, Normal) - simple problems.

UNIT 4:
Sampling from finite population – Simple random sampling , Stratified and Systematic random sampling procedures – Estimation of mean and total and their S.E. – Concept of sampling and non sampling errors.

UNIT 5:
BOOKS FOR STUDY:


BOOKS FOR REFERENCE:

PRACTICALS FOR ALLIED
STATISTICAL METHODS AND THEIR APPLICATIONS I & II
(YSM2)

Credits : 2 (3 hrs/week)

Objective : To enhance computing skills by analyzing data using various statistical techniques.

NOTE : Use of scientific calculators may be permitted for Statistical methods and their applications practical examination. Statistical and Mathematical tables are to be provided to the students at the examination hall.

Record of practical : 10 marks Practical Exam : 40 Marks

1. Construction of univariate and bivariate frequency distributions with samples of size not exceeding 200.
2. Diagrammatic and graphical representation of various statistical data and frequency distributions.
3. Cumulative frequency distribution – Ogives & Lorenz curve.
4. Computation of various measures of location, dispersion (absolute and relative), moments, skewness and kurtosis.
5. Curve fitting by the method of least squares:
   (i)\(y=ax+b\)  (ii)\(y=ax^2+bx+c\)  (iii)\(y=ae^{bx}\)
6. Computation of correlation coefficient and regression lines for raw and grouped data. Rank correlation coefficient.
7. Fitting of Binomial, Poisson and Normal distributions and tests of goodness of fit.
8. Large sample tests
9. Exact tests of significance based on t, Chi-square and F distributions with regard to population proportion(s), mean(s), variance and coefficient of correlation.
10. Analysis of CRD, RBD and LSD.
NON - MAJOR ELECTIVE – I

ELEMENTS OF ACTUARIAL STATISTICS (NST1)

Credits : 2                                                                                    (2 hrs/week)

Objective : To impart basic concepts in actuarial studies.

UNIT 1:
Simple interest – compound interest, Nominal and effective rate of interest – annuities – types of annuities – present value and accumulated value.

UNIT 2:

UNIT 3:

BOOKS FOR STUDY :

NON – MAJOR ELECTIVE II

MARKETING RESEARCH (NST2)

Credits : 2 (2 hrs/week)

Objective : To introduce statistical concepts in marketing research.

UNIT 1:

UNIT 2:
Qualitative techniques of data collection – scaling techniques – sampling decisions.

UNIT 3:
Univariate data analysis – parametric and nonparametric tests.

BOOKS FOR STUDY :