Govt. College for Women, Parade
(An Autonomous College)

Syllabus of the Subject: Statistics

for Semesters I-II

of

Four Years Under-Graduate Programme (FYUP)

Under CBCS as per NEP-2020

Dec. 2022

Annexure -01

Course Type: - Major Theory Course	**Course Title: - Fundamental of Statistics**
Course Code: - USTMJT101	**Total Credits:-04**
Total Marks:-100 (80+20)	**Total Teaching Hours:-60**

Objective of Course

- To impart students the basic knowledge of Statistics, its scope and importance in various fields.
- Enables students to understand diagrammatic and graphical techniques, measures of central tendency and measure of dispersion, skewness and kurtosis and their significance.
- To provide the knowledge of calculation of correlation and regression and also enables to deal with their problems based on fitting of curve and determination of correlation.

Learning outcomes of the course

After completing this course, a student will have

- Ability to understand concepts of sample vs. population, different types of data.
- Ability to represent & to describe the data and to deal with problems based on central tendency, dispersion, determination of Regression lines and calculation of Correlation coefficient.

Scope of the course in terms of:

a) Enhancing the knowledge quotient of the students about the programme of which the course is a part:

B.A. /B.Sc. course in Statistics is aimed at providing an analytical and conceptual understanding of the subject to bachelor's level students so, that they are able to apply this knowledge practically. Statistics is the branch of study where the students will be trained to perform various analytical and mathematical tasks like analysis, collection, presentation and organization of the numerical data.

The B.A./B.Sc.Statistics students are also trained to interpret the aggregates of data that is too large and is difficult to understand by ordinary observation. The main aim is to train B.A./B.Sc. students to collect, study, analyze, interpret and use it to solve the industrial, social and scientific problems. The statistics find its application in almost all the fields like life sciences, economics, data science, risk management and marketing management.

The statistics subject is often bundled with relevant subjects like mathematics, computer science and Statistics students will be le arning these subjects simultaneously to analyze the data and provide accurate information.

The syllabus covers all the aspects related to statistics so, as to provide a holistic understanding of the subject to the undergraduate students. The course structure and design are such that the students pursuing the course are taught about all the aspects of the subjects in a gradual and progressive manner.

b) Employment Generation:

With the advent of technology and increased demand, the scope of Statistics has been increasing in recent times. Statistics is required in almost every field, including business, agriculture, industry, government, private, etc.

After completing UG in Statistics, a student can also go for higher studies by pursuing PG Statistics or

can even opt for Indian Statistical Service, Civil Service & Indian Economic Service exams, Statisticians, Business Analyst, Professor, Risk Analyst, Data Analyst, Content Analyst, Statistic Trainer, Data Scientist, Consultant, Biostatistician, Econometrician etc.

Statistics Jobs are currently full of lucrative opportunities for the candidates. Most private and government companies rely on statistics and data to formulate strategies and create, plan or design a service. Candidates pursuing B.Sc Statistics subjects are hired mainly in companies for data collection and data interpretation roles where they collect and analyse crucial data for business development and enhancing the customer base.

Syllabus

UNIT I   **12 Hours**
Introduction to Statistics: - Statistics, Importance & Scope, Concept of Statistical population & Sample.
Collection of data:-Discrete and Continuous, Different types of scales – Nominal, Ordinal, Ratio and Interval, Primary data – designing a questionnaire and schedule, Collection of primary data, checking their consistency, Secondary data, Uni-variate, Bi-variate and Multivariate.
Presentation of data:- Classification & Tabulation, Diagrammatic Representation –Line, Bar Diagram, Pie Diagram, Frequency distributions-basic Definitions with illustrations, Graphical Representation-Histogram, Frequency Polygon, Frequency Curve, Ogive.

UNIT II   **12 Hours**
Measures of Central Tendency: - Meaning, Requisites, Various types of measures of Central tendency along with properties and Merits & Demerits
Measures of Dispersion:-Meaning, Requisites, Various types of measures of Dispersion along with properties and Merits & Demerits. Partition Values.

UNIT III   **12 Hours**
Moments:-Meaning and their inter-relations with properties- problems on ungrouped and grouped data, Shephard's correction for moments (without Proof).
Skewness & Kurtosis: - Meaning, Measures of Skewness and Kurtosis and their significance, Measures based on quartiles. Box Whisker Plot and Outliers.

UNIT IV   **12 Hours**
Bi-variate Data:- Correlation, Types of relationships, Scatter diagram, Karl-Pearson's Correlation Coefficient and its properties, Spearman Rank correlation and its coefficient, Concept of Partial and Multiple Correlation, Coefficient of determination, Method of Concurrent Deviations.

UNIT V   **12 Hours**
Linear Regression: - Regression lines, regression coefficient and their properties.
Non-Linear Regression: - Meaning of curve fitting, fitting of straight line, parabola, exponential and power curves by method of least squares.

Books Recommended: -
- Goon, A.M., Gupta, M.K. and Dasgupta, B. Fundamental of Statistics, Vol I, World Press, Kolkata.
- Goon, A.M., Gupta, M.K. and Dasgupta, B. Fundamental of Statistics, Vol II, World Press, Kolkata. Gupta, S.C. and Kapoor, V.K. Fundamentals of Mathematical Statistics, Sultan Chand and Sons.

- Miller, I. and Miller, M. John E. Freund's Mathematical Statistics with Applications, Pearson Education, Asia.
- Mood, A.M. Graybill, F.A. and Boes, D.C. Introduction to the Theory of Statistics, 3rd Edn., Tata McGraw-Hill Pub. Co. Ltd. Weatherburn, C.E. (1961). A First Course in Mathematical Statistics, The English Lang. Book Society and Cambridge Univ. Press.
- David, S.: Elementary Probability, Cambridge University Press.
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- Johnson, S. and Kotz, S. Distribution in Statistics Vol. I-II & III,
- Houghton and Mifflin. Lipschutz, S., Lipson, M. L. and Jain, K. Schaum's Outline of Probability, McGraw Hill Education Pvt. Ltd, New Delhi.
- Mukhopadhyay, P. Mathematical Statistics, New Delhi, New Central Book Agency Pvt. Ltd.
- Rohatgi, V.K. and Saleh, A.E. (2008). An introduction to Probability Theory and Mathematical Statistics, Wiley Eastern.

Examination pattern shall be as under: -

1. 20 marks shall be earmarked for internal assessment (5 marks for attendance +15 for assessment test).
2. Scheme for award of marks for attendance shall be same as followed by the College
3. Internal assessment test shall be conducted after the completion of 40% of the syllabus (2 Units) in a particular course.

Pattern for setting internal assessment test paper: -

The paper shall comprise of three sections: -
a) Short answer questions – Attempt two questions of 2 marks each out of three questions (Maximum of 30 words each)

b) Medium answer question - Attempt two questions of 3 marks each out of 3 question (Maximum of 50 words each)

c) Long answer question - Attempt one question out of two questions of 5 marks each (Maximum of 100 words)

Note: - Questions shall be set in such a way that the syllabi prescribed for the examination is fully represented.

Duration of the paper: - 1 hour

Attendance Evaluation

For all the courses- Theory and Practical

Percentage of Attendance	Marks
>90%	05
85%-90%	04
80%-85%	03
75%-80%	02

*75% Attendance is mandatory for all the Students to appear in External Examination

Pattern of External Examination:

Total marks: - 80   **Time allowed: - 3 hours**

The paper shall comprise of three sections:

a) Short answer questions - 5 questions of 3 marks each (one question shall be asked from each unit). All questions are compulsory

b) Medium answer questions – 5 questions of 7 marks each (one question shall be asked from each unit). All questions are compulsory

c) Long answer questions: - 5 questions be set from five units, and the students shall be asked to attempt 2 questions only. Each question shall be of 15 marks.

(The word limit shall be same as is the usual practice in external examination of similar weightage.)

Semester-I

Course Type: - Major Practical Course	**Course Title: - Fundamental of Statistics**
Course Code: - USTMJP-101	**Total Credits:-02**
Total Marks:-50	

Objective of Course

- To provide practical knowledge to the students on various topics elaborated in this course.
- Enables students to apply the relevant concepts to real life problems.

Learning outcomes of the course

Students shall be able to:
- Solve the practical problems based on central tendency and dispersion.
- Solve the practical problems based on calculation of correlation and curve fitting by using regression method.

Practical Exercises

- Graphical representation of data by Histogram, Frequency polygons, frequency curves and Ogives.
- Graphically locate measures of central tendency & Partition values.
- Calculation of Measures of Central Tendency.
- Calculation of Measures of Dispersion.
- Calculation of Moments.
- Measures of Skewness and Kurtosis.
- Calculation of Correlation coefficient – grouped and ungrouped data.
- Determination of Rank correlation.
- Determination of Regression lines.
- Fitting of straight line and second degree parabola.
- Power curve and exponential curve.

Examination Pattern

a. Marks of external examination= 25
b. Marks of internal evaluation= 25

a. Internal Practical Examination

All the three components of internal assessments are mandatory

Components of internal evaluation of Practical	Marks
Attendance	05
Test	08
Lab Involvement	05
Mini Project	05
Field Visit	02
Total	25

The practical file related to the number of experiments performed must be duly signed by the teacher in charge and must be authenticated by the HOD Statistics. For appearing in the external practical examination, certified record should also be produced.

b. External Practical Examination

For all the practical papers, there will be an external evaluation. The external examiner will be appointed by the Principal of the college in consultation with the HOD in charge. There will be an internal examiner who will be appointed by the head of the department. The examination will be of three-hour duration and the various components for the evaluation of external examination are given below.

Components of external evaluation of Practical examination	Marks
Test	20
Viva- voce	05
Total	25

Semester-I

Course Type: - Minor Theory Course	**Course Title: - Fundamental of Statistics**
Course Code: - USTMIT101	**Total Credits:-04**
Total Marks:-100 (80+20)	**Total Teaching Hours:-60**

Objective of Course

- To impart students the basic knowledge of Statistics, its scope and importance in various fields.
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Learning outcomes of the course

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- Ability to understand concepts of sample vs. population, different types of data.
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Scope of the course in terms of:

a) **Enhancing the knowledge quotient of the students about the programme of which the course is a part:**

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The statistics subject is often bundled with relevant subjects like mathematics, computer science and Statistics students will be learning these subjects simultaneously to analyze the data and provide accurate information.

The syllabus covers all the aspects related to statistics so, as to provide a holistic understanding of the subject to the undergraduate students. The course structure and design are such that the students pursuing the course are taught about all the aspects of the subjects in a gradual and progressive manner.

b) **Employment Generation:**

With the advent of technology and increased demand, the scope of Statistics has been increasing in recent times. Statistics is required in almost every field, including business, agriculture, industry, government, private, etc.

After completing UG in Statistics, a student can also go for higher studies by pursuing PG Statistics or can even opt for Indian Statistical Service, Civil Service & Indian Economic Service exams, Statisticians, Business Analyst, Professor, Risk Analyst, Data Analyst, Content Analyst, Statistic Trainer, Data Scientist, Consultant, Biostatistician, Econometrician etc.

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Syllabus

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Pattern for setting internal assessment test paper: -

The paper shall comprise of three sections: -

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c) Long answer question -   Attempt   one question out of two questions of 5 marks each (Maximum of 100 words)

Note: - Questions shall be set in such a way that the syllabi prescribed for the examination is fully represented

Duration of the paper: -   1 hour

Attendance Evaluation

For all the courses- Theory and Practical

Percentage of Attendance	Marks
>90%	05
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80%-85%	03
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*75% Attendance is mandatory for all the Students to appear in External Examination

Pattern of External Examination:

Total marks: - 80   **Time allowed: - 3 hours**

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c) Long answer questions: - 5 questions be set from five units, and the students shall be asked to attempt 2 questions only. Each question shall be of 15 marks.

(The word limit shall be same as is the usual practice in external examination of similar weightage.)

Semester-I

Course Type: - Minor Practical Course   **Course Title: - Fundamental of Statistics**
Course Code: - USTMIP-101   **Total Credits:-02**
Total Marks:-50

Objective of Course

- To provide practical knowledge to the students on various topics elaborated in this course.
- Enables students to apply the relevant concepts to real life problems.

Learning outcomes of the course
Students shall be able to:
- Solve the practical problems based on central tendency and dispersion.
- Solve the practical problems based on calculation of correlation and curve fitting by using regression method.

Practical Exercises
- Graphical representation of data by Histogram, Frequency polygons, frequency curves and Ogives.
- Graphically locate measures of central tendency & Partition values.
- Calculation of Measures of Central Tendency.
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- Calculation of Correlation coefficient – grouped and ungrouped data.
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- Fitting of straight line and second degree parabola.
- Power curve and exponential curve.

Examination Pattern
a. Marks of external examination= 25
b. Marks of internal evaluation= 25

a.   Internal Practical Examination
All the three components of internal assessments are mandatory

Components of internal evaluation of Practical	Marks
Attendance	05
Test	08
Lab Involvement	05
Mini Project	05
Field Visit	02
Total	25

The practical file related to the number of experiments performed must be duly signed by the teacher in charge and must be authenticated by the HOD Statistics. For appearing in the external practical examination, certified record should also be produced.

b. External Practical Examination

For all the practical papers, there will be an external evaluation. The external examiner will be appointed by the Principal of the college in consultation with the HOD in charge. There will be an internal examiner who will be appointed by the head of the department. The examination will be of three-hour duration and the various components for the evaluation of external examination are given below.

Components of external evaluation of Practical examination	Marks
Test	20
Viva- voce	05
Total	25

Semester-II

Course Type: - Major Theory Course	**Course Title: - Probability Theory**
Course Code: - USTMJT201	**Total Credits:-04**
Total Marks:-100 (80+20)	**Total Teaching Hours:-60**

Objective of Course
- To provide the concept of probability along with basic laws.
- To understand the concept of random variable and probability distributions and Attributes.

Learning outcomes of the Course:
After completing this course, students should have developed a clear understanding of:
- The concept of probability along with basic laws, mutually exclusive and independence and their relevance and ability to apply basic probability principles to solve real life problems
- The concept of random variable (discrete and continuous), concept of probability distribution & conditional probabilities based on Bayes Theorem.
- To deal with problems of attributes.

Scope of the course in terms of:

a) **Enhancing the knowledge quotient of the students about the programme of which the course is a part:**

B.A./B.Sc. course in Statistics is aimed at providing an analytical and conceptual understanding of the subject to bachelor's level students so, that they are able to apply this knowledge practically. Statistics is the branch of study where the students will be trained to perform various analytical and mathematical tasks like analysis, collection, presentation and organization of the numerical data.

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b) **Employment Generation:**
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Syllabus

UNIT I   12 Hours
Set: Definition, Concept of sets, Different operations of Sets. Venn-Diagram.
Probability: Random experiment, Trial, Sample point and Sample space, Events, Operations of events, Concept of equally likely, Mutually exclusive and Exhaustive events. Classical, Relative frequency and Axiomatic approaches, Independence of Events.

UNIT II   12 Hours
Conditional Probability: Conditional Probability, Total and Compound Probability theorems. **B**ayes Theorem- Statement and Derivation & its applications.
Random Variables: - Discrete and Continuous, Probability Mass Function (pmf) and Probability density function (pdf), Cumulative distribution function (cdf) with properties. Joint distribution of two random variables, Marginal and Conditional distributions, Independence of random variables.

UNIT III   12 Hours
Transformation of Random variables: Jacobian of Transformation for one and two variables with illustrations.
Expectation:- Expectation of a random variable and its properties with applications, Expectation of sum of random variables and product of independent random variables, Conditional Mean and Conditional variance.

Unit IV   12 Hours
Moment generating function: Moment generating function (m.g.f.) & their properties. Cumulant generating function.
Characteristic Function: Characteristic function & its properties- Uniqueness and inversion theorems along with applications.

UNIT V   12 Hours
Probability Inequalities: - Basic inequality, Boolean inequality, Markov inequality, Jensen inequality & Chebyshev inequality-Statement & Proof along with simple examples.
Convergence: Convergence in probability-Concept; Central Limit Theorem (C.L.T.) for i.i.d. variables and applications of C.L.T.

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- Johnson, R.A. and Bhattacharya, G.K.: Statistics-Principles and Methods, 4th Edn. John Wiley and Sons.
- Biswas Dr. Debaprasanna: Probability and Statistics, Vol-1, New Central Book Agency (P) Ltd, London. 2009

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Note: - Questions shall be set in such a way that the syllabi prescribed for the examination is fully represented

Duration of the paper: -   1hour

Attendance Evaluation

For all the courses- Theory and Practical

Percentage of Attendance	Marks
>90%	05
85%-90%	04
80%-85%	03
75%-80%	02

*75% Attendance is mandatory for all the Students to appear in External Examination

Pattern of External Examination:

Total marks: - 80   **Time allowed: - 3 hours**

The paper shall comprise of three sections.

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c) Long answer questions: - 5 questions be set from five units, and the students shall be asked to attempt 2 questions only. Each question shall be of 15 marks.

(The word limit shall be same as is the usual practice in external examination of similar weightage.)

Semester-II

Course Type:- Major Practical Course   **Course Title: - Probability Theory**
Course Code: - USTMJP-201   **Total Credits:-02**
Total Marks:-50

Objective of Course
- To provide practical knowledge to the students on various topics elaborated in this course.
- Enables students to apply the relevant concepts to real life problems.

Learning outcomes of the course
Students shall be able to:
- Solve the practical problems based on Probability and Bayes Theorem.
- Solve the practical problems based on Attributes.

Practical Exercises
- Obtain Probability Mass Function.
- Obtain Probability Density Function.
- Obtain Cumulative Distribution Function.
- Computation of conditional probabilities based on Bayes theorem.
- Computation of Joint, Marginal & Conditional probabilities.
- Area Properties of Normal Distribution.
- Fitting of Binomial and Poisson distribution & Normal distribution.
- Checking consistency of data and finding association among attributes.

Examination Pattern
a. Marks of external examination= 25
b. Marks of internal evaluation= 25

a. Internal Practical Examination

All the three components of internal assessments are mandatory

Components of internal evaluation of Practical	Marks
Attendance	05
Test	08
Lab Involvement	05
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Field Visit	02
Total	25

The practical file related to the number of experiments performed must be duly signed by the teacher in charge and must be authenticated by the HOD Statistics. For appearing in the external practical examination, certified record should also be produced.

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Test	20
Viva- voce	05
Total	25

Semester-II

Course Type: - Minor Theory Course	**Course Title: - Probability Theory**
Course Code: - USTMIT201	**Total Credits:-04**
Total Marks:-100 (80+20)	**Total Teaching Hours:-60**

Objective of Course
- To provide the concept of probability along with basic laws.
- To understand the concept of random variable and probability distributions and Attributes.

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After completing this course, students should have developed a clear understanding of:
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The B.A./B.Sc.Statistics students are also trained to interpret the aggregates of data that is too large and is difficult to understand by ordinary observation. The main aim is to train B.A./B.Sc. students to collect, study, analyze, interpret and use it to solve the industrial, social and scientific problems. The statistics find its application in almost all the fields like life sciences, economics, data science, risk management and marketing management.

The statistics subject is often bundled with relevant subjects like mathematics, computer science and Statistics students will be learning these subjects simultaneously to analyze the data and provide accurate information.

The syllabus covers all the aspects related to statistics so, as to provide a holistic understanding of the subject to the undergraduate students. The course structure and design are such that the students pursuing the course are taught about all the aspects of the subjects in a gradual and progressive manner.

b) **Employment Generation:**

With the advent of technology and increased demand, the scope of Statistics has been increasing in recent times. Statistics is required in almost every field, including business, agriculture, industry, government, private, etc.

After completing UG in Statistics, a student can also go for higher studies by pursuing PG Statistics or can even opt for Indian Statistical Service, Civil Service & Indian Economic Service exams, Statisticians, Business Analyst, Professor, Risk Analyst, Data Analyst, Content Analyst, Statistic Trainer, Data Scientist, Consultant, Biostatistician, Econometrician etc.

Statistics Jobs are currently full of lucrative opportunities for the candidates. Most private and government companies rely on statistics and data to formulate strategies and create, plan or design a service. Candidates pursuing B.Sc. Statistics subjects are hired mainly in companies for data collection and data interpretation roles where they collect and analyse crucial data for business development and enhancing the customer base.

Syllabus

UNIT I   **12 Hours**
Set: Definition, Concept of sets, Different operations of Sets. Venn-Diagram.
Probability: Random experiment, Trial, Sample point and Sample space, Events, Operations of events, Concept of equally likely, Mutually exclusive and Exhaustive events. Classical, Relative frequency and Axiomatic approaches, Independence of Events.

UNIT II   **12 Hours**
Conditional Probability: Conditional Probability, Total and Compound Probability theorems. **B**ayes Theorem- Statement and Derivation & its applications.
Random Variables: - Discrete and Continuous, Probability Mass Function (pmf) and Probability density function (pdf), Cumulative distribution function (cdf) with properties. Joint distribution of two random variables, Marginal and Conditional distributions, Independence of random variables.

UNIT III   **12 Hours**
Transformation of Random variables: Jacobian of Transformation for one and two variables with illustrations.
Expectation:- Expectation of a random variable and its properties with applications, Expectation of sum of random variables and product of independent random variables, Conditional Mean and Conditional variance.

Unit IV   **12 Hours**
Moment generating function: Moment generating function (m.g.f.) & their properties. Cumulant generating function.
Characteristic Function: Characteristic function & its properties- Uniqueness and inversion theorems along with applications.

UNIT V   **12 Hours**
Probability Inequalities: - Basic inequality, Boolean inequality, Markov inequality, Jensen inequality & Chebyshev inequality-Statement & Proof along with simple examples.
Convergence: Convergence in probability-Concept; Central Limit Theorem (C.L.T.) for i.i.d. variables and applications of C.L.T.

Books Recommended: -
- Goon, A.M., Gupta, M.K. and Dasgupta, B. Fundamental of Statistics, Vol I, World Press, Kolkata.
- Goon, A.M., Gupta, M.K. and Dasgupta, B. Fundamental of Statistics, Vol II, World Press, Kolkata.
- Gupta, S.C. and Kapoor, V.K. Fundamentals of Mathematical Statistics (10th ed.), Sultan Chand and Sons.
- Miller, I. and Miller, M. John E. Freund's Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia.

- Mood, A.M. Graybill, F.A. and Boes, D.C. Introduction to the Theory of Statistics, 3rd Edn., Tata McGraw-Hill Pub. Co. Ltd.
- Weatherburn, C.E. A First Course in Mathematical Statistics, The English Lang. Book Society and Cambridge Univ. Press.
- Johnson, S. and Kotz, S. Distribution in Statistics Vol. I-II & III,
- Houghton and Mifflin. Lipschutz, S., Lipson, M. L. and Jain, K. Schaum's Outline of Probability, McGraw Hill Education Pvt. Ltd, New Delhi.
- Mukhopadhyay, P. Mathematical Statistics, New Delhi, New Central Book Agency Pvt. Ltd.
- Rohatgi, V.K. and Saleh, A.E. An introduction to Probability Theory and Mathematical Statistics, Wiley Eastern.
- Hogg, R.V. and Tanis, E.A: A Brief Course in Mathematical Statistics. Pearson Education.
- Johnson, R.A. and Bhattacharya, G.K.: Statistics-Principles and Methods, 4th Edn. John Wiley and Sons.
- Biswas Dr. Debaprasanna: Probability and Statistics, Vol-1, New Central Book Agency (P) Ltd, London. 2009

Examination pattern shall be as under: -

1. 20 marks shall be earmarked for internal assessment (5 marks for attendance +15 for assessment test).
2. Scheme for award of marks for attendance shall be same as followed by the College
3. Internal assessment test shall be conducted after the completion of 40% of the syllabus (2 Units) in a particular course.

Pattern for setting internal assessment test paper: -

 The paper shall comprise of three sections: -

   a) Short answer questions – Attempt two questions of 2 marks each out of three questions
        (Maximum of 30 words each)

   b) Medium answer question - Attempt two questions of 3 marks each out of 3 question
       (Maximum of 50 words each)

   c) Long answer question -   Attempt   one question out of two questions of 5 marks each
       (Maximum of 100 words)

Note: - Questions shall be set in such a way that the syllabi prescribed for the examination is fully represented.

Duration of the paper: -   1 hour

Attendance Evaluation

For all the courses- Theory and Practical

Percentage of Attendance	Marks
>90%	05
85%-90%	04
80%-85%	03
75%-80%	02

*75% Attendance is mandatory for all the Students to appear in External Examination.

Pattern of External Examination:

Total marks: - 80   **Time allowed: - 3 hours**

The paper shall comprise of three sections.

a) Short answer questions - 5 questions of 3 marks each (one question shall be asked from each unit). All questions are compulsory

b) Medium answer questions – 5 questions of 7 marks each (one question shall be asked from each unit). All questions are compulsory

c) Long answer questions: - 5 questions be set from five units, and the students shall be asked to attempt 2 questions only. Each question shall be of 15 marks.

(The word limit shall be same as is the usual practice in external examination of similar weightage.)

Semester-II

Course Type: - Minor Practical Course   **Course Title: - Probability Theory**
Course Code: - USTMIP-201   **Total Credits:-02**
Total Marks:-50

Objective of Course
- To provide practical knowledge to the students on various topics elaborated in this course.
- Enables students to apply the relevant concepts to real life problems.

Learning outcomes of the course
Students shall be able to:
- Solve the practical problems based on Probability and Bayes Theorem.
- Solve the practical problems based on Attributes.

Practical Exercises
- Obtain Probability Mass Function.
- Obtain Probability Density Function.
- Obtain Cumulative Distribution Function.
- Computation of conditional probabilities based on Bayes theorem.
- Computation of Joint, Marginal & Conditional probabilities.
- Mean & Variance through Expectation
- Basic problems based on inequalities.
- Problems based on CLT for i.i.d. variates

Examination Pattern
a. Marks of external examination= 25
b. Marks of internal evaluation= 25

a. Internal Practical Examination
All the three components of internal assessments are mandatory

Components of internal evaluation of Practical	Marks
Attendance	05
Test	08
Lab Involvement	05
Mini Project	05
Field Visit	02
Total	25

The practical file related to the number of experiments performed must be duly signed by the teacher in charge and must be authenticated by the HOD Statistics. For appearing in the external practical examination, certified record should also be produced.

b. External Practical Examination
For all the practical papers, there will be an external evaluation. The external examiner will be appointed by the Principal of the college in consultation with the HOD in charge. There will be an internal examiner who will be appointed by the head of the department. The examination will be of three-hour duration and the various components for the evaluation of external examination are given below.

Components of external evaluation of Practical examination	Marks
Test	20
Viva- voce	05
Total	25

Annexure-02

Semester-I

Course Type: - Skill Enhancement Course	**Course Title: - Informatics & Data Analysis.**
Course Code: - USTSET-101	**Total Credits:-02**
Total Marks:-50	**Total Teaching Hours:-30**

Objective of Course

- To express the students to the real-life skill for statistical computing analysis and graphical interpretation using Excel.
- Hands on training on the problem based on course, can be done to enhance data analysis skill.
- To learn analysis of various kinds of data using excel.

Learning outcomes of the Course:

The following are the expected outcomes of the course:

- Handle and process the data using excel.
- Perform the analysis with analysis tool pack in excel.
- Customize menus and toolbars in excel.
- Understand and apply various functions available in excel.

Scope of the course in terms of:

a) **Enhancing the knowledge quotient of the students about the programme of which the course is a part:**

This course is designed to provide basic working knowledge for using Excel spreadsheets for Data Analysis. It covers some of the first steps for working with spreadsheets and their usage in the process of analyzing data. Excel is an essential tool for working with data - whether for business, marketing, data analytics, or research. This course is suitable for those aspiring to take up Data Analysis or Data Science as a profession, as well as those who just want to use Excel for data analysis in their own domains.

This course aims to provide skills and knowledge which will allow the attendee to Learn MS Excel tools. MS Excel provides many analytical tools for the accurate analysis and comparison of large amounts of data. The advanced sorting and filtering techniques helps to sort out large amount of data so that it will be easier to find out the required information. Also, filtering removes unwanted or repeated data and helps to save time and effort.

MS Excel allows creating the visual representation of data and information. The data can be visually displayed in the form of bar charts, column charts and graphs. It automatically revises the charts and graphs, once the data gets modified. Tables help to classify different entities according to their characteristics and features.

MS Excel performs all mathematical and logical functions like addition, subtraction, multiplication, division, average, sum, mod, product etc. Excel provides many formulas that help to solve both simple and complex calculations.

b) Employment Generation:

Microsoft Excel is one of the simplest and powerful software applications. Students can do quantitative analysis, statistical analysis with an intuitive interface for data manipulation, so much so that its usage spans across different domains and professional requirements.

Here are a few job options: Accountants and auditors, Administrative assistants, office clerks, information staff, Business, management, and market analysts, Cost estimators, Educators, teaching assistants, and teachers, Financial analysts, investment bankers, and loan officers, Market research analysts and digital marketers, Project managers, project coordinators, and construction managers, Sales, marketing, training and administrative managers.

Syllabus

UNIT -I   15 Hours

Introduction to Computers: Historical evolution of Computers. Generations of Computers. Classification of Computers, Applications of Computers.

Computer Memory: Primary and Secondary Memory, Hardware: CPU, I/O Devices. Block diagram.

Windows: The User Interface, The Desk Top, The Task Bar, The Control Panel, The Find Features, Properties, Font Management, Systems Tools, Character Map, The My Computer ICON, Folders, Short-Cuts.

MS Access: Creating and Saving a Document, Editing the Text: Printing, Saving and Importing Documents.

UNIT-II   15 Hours

Basics of Excel: Data Entry, Sorting of data, Built in Functions in Excel. Random Number Generation, Macros.

Sample Selection: Sample Selection from Binomial, Poisson & Normal Distribution,

Diagrammatic/Graphical Representation of data: By Line diagram, Bar Diagram, Histograms, Frequency Polygon, Pie Chart, Ogive and Box Plot.

Statistical Tools: Measures of Central Tendency, Partition Values. Measures of Dispersion, Skewness, Kurtosis, Correlation & regression.

Books Recommended:
1. V Rajaraman: Fundamentals of Computers. PHI.
2. Sanders, H.D.: computer Today, Mc Graw Hill.
3. Gupta Vikram, Bhatia S.S, Thakur P.S., Sharma Vinus: Computer Fundamentals And It   Tools. Kalyani Publishers
4. S.P Gupta: Statistics, S Chand and Co.
 5. Brend Held (2007): Microsoft Excel Functions and Formulas. Wordware Publishing. Inc.
6. D. Remenyi, G. Onofrei. J. English (2011): An introduction Statistics Using Microsoft Excel.. Academic Publishing Limited.

Examination pattern shall be as under: -

Internal Assessment: 10 marks

1. Internal Assessment shall be based on Unit-I

Pattern for setting internal assessment test paper

The paper shall comprise of three sections: -

a) Short answer questions – Attempt two questions of 1 mark each out of three questions
   (Maximum of 20 words each)

b) Medium answer question - Attempt two questions of 2 marks each out of 3 questions
   (Maximum of 30 words each)

c) Long answer question - Attempt one question out of two questions of 4 marks each
   (Maximum of 50 words)

Duration of the paper: - ¾ hour (45 Minutes)

Pattern of External Examination:

Total marks: - 40   **Time allowed: - 2 hours**

The paper shall comprise of 3 sections

a) Short answer questions - 4 questions of 2 marks each. Two questions shall be set from each unit in such a way that the whole syllabus prescribed for a course is represented. All questions are compulsory.

b) Medium answer questions – 4 questions of 5 marks each. Two questions shall be set from each unit in such a way that the whole syllabus prescribed for a course is represented. All questions are compulsory

c) Long answer questions: -4questions of 12 marks be set from two units, and the students shall be asked to attempt 1 question only. Each question shall be of 12 marks.

Semester-II

Course Type: - Skill Enhancement Course   **Course Title: - DATA ANALYSIS USING R**
Course Code: - USTSET-201   **Total Credits:-02**
Total Marks:-50   **Total Teaching Hours:-30**

Objective of the Course:

- To learn the statistical analysis using 'R' free and open source software.
- R is one of the most powerful and popular statistical programming languages used by data scientists today thus it will prepare the students with current market pace.

Learning Outcomes of the course:

After completing this course a student will be able:
- Understand basics of R environment.
- Perform various operations on data in R.
- Do descriptive statistical analysis in R.

Scope of the course in terms of:

a) **Enchancing the knowledge quotient of the students about the programme of which the course is a part:**

Statistics skills are capabilities and competency traits that allow someone to use statistics in order to gauge the probability of a particular outcome. Statistics are generally a combination of several qualifying traits, including math, computer literacy, data analysis and critical thinking. This skill gives people a better understanding of how to review data critically to gather useful information. This information serves to help in important problem-solving and decision-making processes. Students can use this skill in several industries, including economics, education, business and medical.

Any scientific task without the knowledge of software is difficult to complete in the current scenario. R is free software that is capable of mathematical and statistical computing. It has its own programming language, built-in functions, and graphical capabilities to perform any specialized task in mathematics, statistics, and other areas. We intend to learn the fundamentals of R software in this course.

b) **Employment Generation:**

R is capable of providing various benefits and covering all the important issues that make it ideal for Data Science operations. R is an open-source language that is contributed to developers and programmers from all around the world. It is continuously expanding and people from the whole world are contributing to its development. This has resulted in R becoming a state of the art programming language. R programmers can avail various types of jobs in the Data Science industry. Since there is a dearth of Data Scientists, both novice and professional R programmers can enter the Data Science industry.
There are various companies like Facebook, Google, and Twitter as well as emerging startups that are using R to meet their analytical goals. At the same time, organizations expect many of the new hires to be

already equipped with knowledge of R. They want them to be familiar with the R tool and how to use it for Data Analysis.

Being an R programmer does not only guarantee jobs in the IT industry but also there are several industries that are making use of data to transform problems into solutions.

R programmers are most in-demand, especially in emerging startups. Some of the positions that are available for the R programmers are as follows:

- Financial Sectors
- Banks
- Health Organisations
- Manufacturing Companies
- Academia
- Governmental departments
- Data Scientist
- Business Analyst
- Data Analyst
- Data Visualization Expert
- Quantitative Analyst

Syllabus

UNIT I   **15 Hours**

    Introduction: Introduction to R Programming and R Studio, Installing R, R as a calculator. Creating a data set, Understanding a data set.

    Data structure: Vectors, Matrices, Arrays, Data Frames, Factors and Lists.

    Data inputs: Entering data from the keyboard, Importing Data, creating new variables, recoding variable, renaming variables.

    Plot a graph: Histograms, box plot, stem-leaf, frequency polygon, pie chart, ogive with graphical summaries of data.

UNIT II   **15 Hours**

    Descriptive Statistics: Absolute Frequency, Relative frequency, Frequency distribution, Cumulative distribution function. Measure of central tendency, Mean, Median, Quartiles, Mode, Geometric Mean and Harmonic Mean.

    Range, Inter-quartile Range and Quartile Deviation, Absolute Deviation and Absolute Mean Deviation, Mean squared error, Variance and Standard deviation.

    Raw and Central Moments, Sheppard's correlation, Absolute moments and computation of moments, Skewness and Kurtosis**.**

    Uni-variate and Bi-variate Scatter Plots, Smooth scatter Plots. Quantile - Quantile (QQ) plot, correlation coefficient and Rank correlation coefficient.

Suggested Readings:
- Kabacoff, R.I. (2015). R in Action: Data Analysis and Graphics in R, 2nd ed., Manning Publications.
- Davies, T. M. (2016). The Book of R: A First Course in Programming and Statistics, No Starch Press, San Francisco.
- Crawley, M.J. (2013). The R Book, 2nd ed., John Wiley.
- Field, A., Miles, J. and Field, Z. (2012). Discovering Statistics using R, Sage, Los Angels.

- Chambers, J. (2008). Software for Data Analysis: Programming with R, Springer.
- Crawley, M.J. (2017). The R Book, John Wiley & Sons. Eckhouse,
- Matloff, N. (2011). The Art of R Programming, No Starch Press, Inc. Eckhouse,
- Braun W J, Murdoch D J (2007): A First Course in Statistical Programming with R. Cambridge University Press. New York.
- Gardener, M (2012) Beginning R : The Statistical Programming Language, Wiley Publications.
- Zuur,F Alain, Leno N Elena, Meesters H.W.G.Erik. (2009). A Beginners Guide to R. Springer.

Examination pattern shall be as under: -

Internal Assessment: 10 marks

2. Internal Assessment shall be based on Unit-I

Pattern for setting internal assessment test paper

The paper shall comprise of three sections: -

d) Short answer questions – Attempt two questions of 1 mark each out of three questions (Maximum of 20 words each)

e) Medium answer question - Attempt two questions of 2 marks each out of 3 questions (Maximum of 30 words each)

f) Long answer question - Attempt one question out of two questions of 4 marks each (Maximum of 50 words)

Duration of the paper: - ¾ hour (45 Minutes)

Pattern of External Examination:

Total marks: - 40   **Time allowed: - 2 hours**

The paper shall comprise of 3 sections

d) Short answer questions - 4 questions of 2 marks each. Two questions shall be set from each unit in such a way that the whole syllabus prescribed for a course is represented. All questions are compulsory.

e) Medium answer questions – 4 questions of 5 marks each. Two questions shall be set from each unit in such a way that the whole syllabus prescribed for a course is represented. All questions are compulsory

f) Long answer questions: -4questions of 12 marks be set from two units, and the students shall be asked to attempt 1 question only. Each question shall be of 12 marks.

Semester-I

Course Type: - Multidisciplinary	**Course Title: - STATISTICS FOR RESEARCHERS**
Course Code: - USTMDT-101	**Total Credits:-03**
Total Marks:-75	**Total Teaching Hours:-45**

Objective of Course

- To impart students the basic knowledge of Statistics, its scope and importance in various fields.
- Enables students to understand diagrammatic and graphical techniques.
- To provide the knowledge of calculation of Descriptive Statistics, correlation and regression.
- To provide the knowledge about testing of hypothesis.

Learning outcomes of the Course:
After completing this course, a student will have
- Ability to collect, tabulate, represent graphically, analyze and interpret data/information by using appropriate statistical tools.
- Ability to deal with problems based on Measures of central tendency, Dispersion, Skewness& Kurtosis.
- Ability to deal with problems based on testing of hypothesis and situations where parametric tests are applicable.

Scope of the course in terms of:

a) **Enhancing the knowledge quotient of the students about the programme of which the course is a part:**

This course is designed for students other than statistics discipline. This course will make the students familiar with
(a) Various techniques used in summarization, presentation and analysis of different types of Statistical data.
(b) Various summary measures of central tendency, dispersion, moments, skewness and kurtosis.
(c) Simple and rank correlation coefficients.
(d) Fitting of regressions using principle of least squares.
(e) Testing of Hypothesis.
(f) Parametric Test.

The proposed syllabus is expected to provide the students a sound knowledge of Statistics covering various aspects. As a result, they will not only appear appropriate for pursuing higher studies in the subject but also develop skill to apply the statistical knowledge to a variety of real life problems. The proposed course is designed to enrich the students with ability to examine the various statistical issues in a more logical and methodical manner. It is expected that the students will strengthen themselves both computationally and analytically.

b) Employment Generation:

A degree in multidisciplinary studies can prepare Students for a variety of different careers. With this degree, Students develop skills in communication, critical thinking, and more. Student with multiple interests can combine their knowledge of different disciplines into one career. The college coursework of a multidisciplinary studies program can help a graduate focus their interests on a single degree path, which may lead to a wide range of occupations.

Common Multidisciplinary Studies degree jobs are:

Market research analyst, Data analyst, Research assistant, Associate market researcher, Quantitative analyst, Development coordinator, Environmental educator, School counselor, Social worker, Urban planner, Urban designer, Community service officer

Syllabus

UNIT-I   **12 Hours**

Introduction to Statistics: - Concept of Statistical Population and Sample, Types of data-Discrete and Continuous, Primary data & Secondary Data.

Presentation of data: - Classification & Tabulation. Frequency distributions

Diagrammatic Representation: - –Line and Bar Diagram, Pie Diagram.

Graphical Representation: - Histogram, Frequency Polygon, Frequency Curve, Ogive.

Unit II   **11 Hours**

Measures of Central Tendency: - Various types of measures of Central tendency and their Merits & Demerits and Examples.

Measures of Dispersion: - Various types of measures of Dispersion and their Merits & Demerits and Skewness & Kurtosis

UNIT III   **11 Hours**

Bi-variate Data:- Correlation, Types of relationships, Scatter diagram, Karl-Pearson's Correlation Coefficient and its properties, Spearman Rank correlation coefficient with Examples.

Unit IV   **11 Hours**

Theory of Attributes: Notation and Terminology, Contingency Table, Class frequency, Ultimate Class Frequency, Relationship between class frequencies.

Consistency of data: Conditions for Consistency of data, Association and Independence of Attributes (Upto 3 Attributes), Yule's Coefficient of Association and Coefficient of Colligation.

Suggested Readings:

- Goon, A.M., Gupta, M.K. and Dasgupta, B. Fundamental of Statistics, Vol I, World Press, Kolkata.
- Goon, A.M., Gupta, M.K. and Dasgupta, B. Fundamental of Statistics, Vol II, World Press, Kolkata.
- Gupta, S.C. and Kapoor, V.K. Fundamentals of Mathematical Statistics (10th ed.), Sultan Chand and Sons.
- Miller, I. and Miller, M. John E. Freund's Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia.

- Mood, A.M. Graybill, F.A. and Boes, D.C. Introduction to the Theory of Statistics, 3rd Edn., Tata McGraw-Hill Pub. Co. Ltd.
- Weatherburn, C.E. A First Course in Mathematical Statistics, The English Lang. Book Society and Cambridge Univ. Press.
- Johnson, S. and Kotz, S. Distribution in Statistics Vol. I-II & III,
- Houghton and Mifflin. Lipschutz, S., Lipson, M. L. and Jain, K. Schaum's Outline of Probability, McGraw Hill Education Pvt. Ltd, New Delhi.
- Mukhopadhyay, P. Mathematical Statistics, New Delhi, New Central Book Agency Pvt. Ltd.
- Rohatgi, V.K. and Saleh, A.E. An introduction to Probability Theory and Mathematical Statistics, Wiley Eastern.
- Hogg, R.V. and Tanis, E.A: A Brief Course in Mathematical Statistics. Pearson Education.

Examination pattern shall be as under: -
Internal Assessment: 15 marks

1. 15 marks shall be earmarked for internal assessment (5 marks for attendance +10 for assessment test.
2. Scheme for award of marks for attendance shall be same as followed by the College.
3. Internal assessment test shall be conducted after the completion of 40% of the syllabus in a particular course. (10 marks)

Pattern for setting internal assessment test paper

The paper shall comprise of three sections: -
   a) Short answer questions – Attempt two questions of 1 mark each out of three questions (Maximum of 20 words each)
   b) Medium answer question - Attempt two questions of 2 marks each out of 3 questions (Maximum of 30 words each)
   c) Long answer question -   Attempt   one question out of two questions each of 4 marks (Maximum of 50 words)

Note: Questions should be set in such a way that the entire syllabus prescribed for the examination is represented.

Duration of the paper: -¾hour (45 Minutes)

Pattern of External Examination:

Total marks: - 60   **Time allowed: - 2.5 hours**

The paper shall comprise of 3 sections:

   a) Short answer questions - 4 questions of 3 marks each. The questions shall be set in such a way that the whole syllabus prescribed for a course is represented. All questions are compulsory.
   b) Medium answer questions – 4 questions of 6 marks each (one question shall be asked from each unit). All questions are compulsory
   c) Long answer questions: - 4 questions be set from four units, and the students shall be asked to attempt 2 questions only. Each question shall be of 12 marks.

Semester-II

Course Type: - Multidisciplinary	**Course Title: - STATISTICS FOR RESEARCHERS**
Course Code: - USTMDT-201	**Total Credits:-03**
Total Marks:-75	**Total Teaching Hours:-45**

Objective of Course

- To impart students the basic knowledge of Statistics, its scope and importance in various fields.
- Enables students to understand diagrammatic and graphical techniques.
- To provide the knowledge of calculation of Descriptive Statistics, correlation and regression.
- To provide the knowledge about testing of hypothesis.

Learning outcomes of the Course:

After completing this course, a student will have
- Ability to collect, tabulate, represent graphically, analyze and interpret data/information by using appropriate statistical tools.
- Ability to deal with problems based on Measures of central tendency, Dispersion, Skewness& Kurtosis.
- Ability to deal with problems based on testing of hypothesis and situations where parametric tests are applicable.

Scope of the course in terms of:

c) Enhancing the knowledge quotient of the students about the programme of which the course is a part:

This course is designed for students other than statistics discipline. This course will make the students familiar with
(a) Various techniques used in summarization, presentation and analysis of different types of Statistical data.
(b) Various summary measures of central tendency, dispersion, moments, skewness and kurtosis.
(c) Simple and rank correlation coefficients.
(d) Fitting of regressions using principle of least squares.
(e) Testing of Hypothesis.
(f) Parametric Test.

The proposed syllabus is expected to provide the students a sound knowledge of Statistics covering various aspects. As a result, they will not only appear appropriate for pursuing higher studies in the subject but also develop skill to apply the statistical knowledge to a variety of real life problems. The proposed course is designed to enrich the students with ability to examine the various statistical issues in a more logical and methodical manner. It is expected that the students will strengthen themselves both computationally and analytically.

d) Employment Generation:

A degree in multidisciplinary studies can prepare Students for a variety of different careers. With this degree, Students develop skills in communication, critical thinking, and more. Student with multiple interests can combine their knowledge of different disciplines into one career. The college coursework of a multidisciplinary studies program can help a graduate focus their interests on a single degree path, which may lead to a wide range of occupations.

Common Multidisciplinary Studies degree jobs are:

Market research analyst, Data analyst, Research assistant, Associate market researcher, Quantitative analyst, Development coordinator, Environmental educator, School counselor, Social worker, Urban planner, Urban designer, Community service officer

Syllabus

UNIT-I   **12 Hours**

Introduction to Statistics: - Concept of Statistical Population and Sample, Types of data-Discrete and Continuous, Primary data & Secondary Data.
Presentation of data: - Classification & Tabulation. Frequency distributions
Diagrammatic Representation: - –Line and Bar Diagram, Pie Diagram.
Graphical Representation: - Histogram, Frequency Polygon, Frequency Curve, Ogive.

Unit II   **11 Hours**

Measures of Central Tendency: - Various types of measures of Central tendency and their Merits & Demerits and Examples.
Measures of Dispersion: - Various types of measures of Dispersion and their Merits & Demerits and Skewness & Kurtosis

UNIT III   **11 Hours**

Bi-variate Data:- Correlation, Types of relationships, Scatter diagram, Karl-Pearson's Correlation Coefficient and its properties, Spearman Rank correlation coefficient with Examples.

Unit IV   **11 Hours**

Theory of Attributes: Notation and Terminology, Contingency Table, Class frequency, Ultimate Class Frequency, Relationship between class frequencies.
Consistency of data: Conditions for Consistency of data, Association and Independence of Attributes (Upto 3 Attributes), Yule's Coefficient of Association and Coefficient of Colligation.

Suggested Readings:

- Goon, A.M., Gupta, M.K. and Dasgupta, B. Fundamental of Statistics, Vol I, World Press, Kolkata.
- Goon, A.M., Gupta, M.K. and Dasgupta, B. Fundamental of Statistics, Vol II, World Press, Kolkata.
- Gupta, S.C. and Kapoor, V.K. Fundamentals of Mathematical Statistics (10th ed.), Sultan Chand and Sons.
- Miller, I. and Miller, M. John E. Freund's Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia.

- Mood, A.M. Graybill, F.A. and Boes, D.C. Introduction to the Theory of Statistics, 3rd Edn., Tata McGraw-Hill Pub. Co. Ltd.
- Weatherburn, C.E. A First Course in Mathematical Statistics, The English Lang. Book Society and Cambridge Univ. Press.
- Johnson, S. and Kotz, S. Distribution in Statistics Vol. I-II & III,
- Houghton and Mifflin. Lipschutz, S., Lipson, M. L. and Jain, K. Schaum's Outline of Probability, McGraw Hill Education Pvt. Ltd, New Delhi.
- Mukhopadhyay, P. Mathematical Statistics, New Delhi, New Central Book Agency Pvt. Ltd.
- Rohatgi, V.K. and Saleh, A.E. An introduction to Probability Theory and Mathematical Statistics, Wiley Eastern.
- Hogg, R.V. and Tanis, E.A: A Brief Course in Mathematical Statistics. Pearson Education.

Examination pattern shall be as under: -
Internal Assessment: 15 marks

1. 15 marks shall be earmarked for internal assessment (5 marks for attendance +10 for assessment test.
2. Scheme for award of marks for attendance shall be same as followed by the College.
3. Internal assessment test shall be conducted after the completion of 40% of the syllabus in a particular course. (10 marks)

Pattern for setting internal assessment test paper:

The paper shall comprise of three sections: -

a) Short answer questions – Attempt two questions of 1 mark each out of three questions (Maximum of 20 words each)
b) Medium answer question - Attempt two questions of 2 marks each out of 3 questions (Maximum of 30 words each)
c) Long answer question -   Attempt one question out of two questions each of 4 marks (Maximum of 50 words)

Questions should be set in such a way that the entire syllabus prescribed for the examination is represented

Duration of the paper: -   ¾ hour (45 Minutes)

Pattern of External Examination:

Total marks: - 60   **Time allowed: - 2.5 hours**

The paper shall comprise of 3 sections:

a) Short answer questions - 4 questions of 3 marks each. The questions shall be set in such a way that the whole syllabus prescribed for a course is represented. All questions are compulsory.
b) Medium answer questions – 4 questions of 6 marks each(one question shall be asked from each unit). All questions are compulsory
c) Long answer questions: - 4 questions be set from four units, and the students shall be asked to attempt 2 questions only. Each question shall be of 12 marks.