

# B. Sc. Hons. Mathematics (Session: 2023-24)

## Semester-I

### BSHMATGE105 :STATISTICAL METHODS-I

L T P  
4 0 0

Duration- 60hrs

External Evaluation: 75

Internal Assessment: 25

Pass marks 40%

**Course Objectives:** The objective of the course is to make the student conversant with various techniques used in summarization and analysis of uni-variata data. After completion of the course the students will be able to use basic concepts of probability in different branches of statistics and other sciences.

**Course Learning Outcomes:** Upon completion of this course, students should be able to:

- Understand the basic concepts of statistics and data collections.
- Summarize data graphically by displaying data using methods from descriptive statistics, interpreting data in tables graphically by using histograms, frequency distributions and compute the central tendency of grouped and ungrouped data.
- Compute the dispersion.
- Correctly apply multiplication rule for two independent events, the addition rule for union of two events, and the Baye's Theorem.

### INSTRUCTIONS FOR THE PAPER SETTER/CANDIDATES

The question paper will consist of three Sections A, B and C. Sections A and B will have four questions from respective sections of the syllabus. Each question will have 12 marks. The students are required to attempt two questions from each section. Section C will be compulsory having only one question which will consist of nine short answer type parts covering the whole syllabus. This question carries 27marks. Time of the exam will be 3 hrs.

### Section-A


**Introduction to Statistics:** Basic definitions and applications of statistics.

**Data Collection and Presentation:** Types of data, collection of primary and secondary data. Methods of data presentation: Diagrammatical and graphical representation.

  
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**Measures of Central Tendency:** Arithmetic Mean, Median, Mode, Geometric Mean and Harmonic Mean.

### Section –B

**Measures of Variability:** Standard deviation, range, quartile deviation, mean deviation and coefficient of variation, moments, skewness, kurtosis, Lorenz curve

**Basic concepts in probability:** Sample space, events, relative frequency, basic definition and concepts of Probability, conditional probability, Bayes' theorem and its applications.

### Recommended and Suggested Readings:

1. Gupta, S. C., Kapoor, V. K.: Fundamentals of Mathematical Statistics, Sultan Chand & Sons Educational Pub. New Delhi, 2019.
2. Goon, A.M., Gupta, M. K. and Dasgupta, B.: Fundamentals of Statistics, Vol. I, World Press Pvt. Ltd., 2013.
3. S. P. Gupta: Statistical methods, Sultan Chand & Sons Educational Pub. New Delhi, Revised Ed. 45<sup>th</sup>, 2017.

### Teaching Learning Activities:

**Assignments:** Class assignments focus on strong foundation of conceptual knowledge, better understanding of the subject and development of problem solving and analytical skills.


**Guest lectures:** Guest lectures are conducted for overall development of students and strong foundation of subject

**Quizzes:** Quizzes are organized to build the bridge between theoretical (conceptual knowledge) and practical applications of the learned concepts.

**Group Discussion:** Group discussions are conducted to develop and boost the self confidence, competitive aptitude and enhance the problem solving and analytical skills.

  
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## B. Sc. Hons. Mathematics (Session: 2023-24)

### BSHMATGE 105(P): PRACTICALS OF STATISTICAL METHODS-I

L T P  
0 0 2

Credits:2(=4Hours)

Duration: 40 hrs

External Evaluation: 50

#### INSTRUCTIONS FOR THE PAPER SETTER/CANDIDATES

The setting and evaluation will be done by a board of examiners consisting of Head, External examiner and the teacher(s) involved with the teaching of this paper.

The practical paper will consist of four exercises and the candidates will be required to attempt any three exercises. Use of scientific non-programmable calculator is allowed.

The break-up of marks for the University Examination will be as under:

Exercises: 25

Lab Record: 10

Viva-voce: 15

Time of the written exam will be 1.30 hrs.

#### Lab Course:

The examination will be based on the syllabus of the paper BSHMATGE105E(i): STATISTICAL METHODS-I.


#### LIST OF PRACTICALS:

- Problems based on Measures of Central Tendency
  - Arithmetic Mean
  - Median
  - Mode
  - Geometric Mean
  - Harmonic Mean
- Problems based on Measures of Dispersion
  - Range
  - Standard deviation
  - Mean deviation
- Measures of Skewness
- Measures of Kurtosis
- Applications based on conditional probability and Baye's Theorem.

  
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# B. Sc. Hons. Mathematics (Session: 2023-24)

## Semester-II

### BSHMATGE 205: STATISTICAL METHODS-II

L T P  
4 0 0

Duration- 60 hrs

External Evaluation: 75

Internal Assessment: 25

Pass marks 40%

**Course Objectives:** The objective of the course is to make the students conversant with various probability distributions. The students will learn various techniques for finding correlation, regression and index numbers. These topics are quite helpful to students for various applications in statistics.

**Course Learning Outcomes:** Upon completion of this course, students should be able to:

- Compute and interpret the results of Bivariate Regression and Correlation Analysis.
- Understand the concepts of intra class correlation
- To compute trend of time series by using Moving Average method.
- Compare the increment and decrement in the price and quantity of commodities in any year as compared to basic year by using index numbers.

### INSTRUCTIONS FOR THE PAPER SETTER/CANDIDATES

The question paper will consist of three Sections A, B and C. Sections A and B will have four questions from respective sections of the syllabus. Each question will have 12 marks. The students are required to attempt two questions from each section. Section C will be compulsory having only one question which will consist of nine short answer type parts covering the whole syllabus. This question carries 27marks. Time of the exam will be 3 hrs.

### Section-A

**Correlation and Regression:** Positive and negative correlation, Karl- Pearson's coefficient of correlation, Spearman's rank correlation coefficient, partial and multiple correlation, intra class correlation.

**Regression:** Linear regression and regression equations and regression coefficients.  
Curve Fitting: Polynomial Regression, Exponential Regression and Geometric Regression.

  
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### Section-B

**Index Numbers:** Definitions, interpretation and applications of index numbers. Problems involved in the construction of index numbers, Laspeyre's, Paasche's, Marshal-Edgeworth formulae for index numbers, Fisher's Ideal index numbers, Errors in index numbers, criterion of good index numbers, uses of index numbers.

**Time Series:** Definition, Components of Time Series, Analysis of Time Series, Mathematical Model of Time series, Measurement of Secular Trend by graphic method, method of semi averages, method of moving average and method of curve fitting.

### Recommended and Suggested Readings:

1. Gupta, S. C., Kapoor, V. K.: Fundamentals of Applied Statistics, Sultan Chand & Sons Educational Pub. New Delhi, 2018.
2. Gupta, S. C., Kapoor, V. K.: Fundamentals of Mathematical Statistics, Sultan Chand & Sons Educational Pub. New Delhi, 2019.
3. Goon, A.M., Gupta, M. K. and Dasgupta, B.: Fundamentals of Statistics, Vol. I, World Press Pvt. Ltd., 2013.
4. Goon, A.M., Gupta, M. K. and Dasgupta, B.: An outline of Statistical Theory Vol.-II, World Press Pvt. Ltd., 2016.

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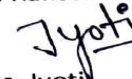
  
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# B. Sc. Hons. Mathematics (Session: 2023-24)

## Semester-II

### BSHMATGE 205(P): PRACTICALS OF STATISTICAL METHODS-II

L T P  
0 0 2

Credits:2(=4Hours)

Duration: 40 hrs

External Evaluation: 50

#### Instructions for the paper setter and the candidates

The setting and evaluation will be done by a board of examiners consisting of Head, External examiner and the teacher(s) involved with the teaching of this paper.

The practical paper will consist of four exercises and the candidates will be required to attempt any three exercises. Use of scientific non-programmable calculator is allowed.

The break-up of marks for the University Examination will be as under:

Exercises: 25

Lab. Record: 10

Viva-voce: 15

Time of the exam will be 1.30 hrs.

#### Lab Course:

The examination will be based on the syllabus of the papers BSHMATGE205E(i): Statistical Methods-II.


#### LIST OF PRACTICALS:

- Problems based on:
  - Karl Pearson's coefficient of correlation.
  - Spearman's Rank coefficient of correlation.
  - Partial and Multiple correlations.
- Principle of least square
- Fitting of linear, exponential and geometric regression.
- Examples based on Moving Average Method of Time Series, Graphic Method, Semi Averages.
- Computation of Index Numbers and Factor reversal and Time reversal tests of Index Numbers

  
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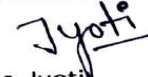
  
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## B. Sc. Hons. Mathematics (Session: 2023-24)

### Semester-III

#### BSHMATGE305: Sampling Techniques

L T P  
4 0 0

Duration- 60 hrs  
External Evaluation: 75  
Internal Assessment: 25  
Pass marks 40%

**Course Objectives:** After completing the course, students will be able to differentiate between non-probabilistic and probabilistic sample surveys. They will also be aware about various errors in a survey. They will be able to perform statistical analysis of real sample surveys.

**Course Learning Outcomes:** Upon completion of this course, students should be able to:

- Identify whether a probability sampling method or a non-probability sampling method was used to obtain the study data.
- Determine if the probability method used to obtain data was a simple random sample with and without replacement, stratified, or cluster.
- Determine if the probability method used to obtain data was a stratified sample and systematic sample

#### INSTRUCTIONS FOR THE PAPER SETTER/CANDIDATES

The question paper will consist of three Sections A, B and C. Sections A and B will have four questions from respective sections of the syllabus. Each question will have 12 marks. The students are required to attempt two questions from each section. Section C will be compulsory having only one question which will consist of nine short answer type parts covering the whole syllabus. This question carries 27 marks. Time of the exam will be 3 hrs.

#### Section – A

**Concepts of population and sample:** Census and sample surveys, need for sampling, principle steps in a Sample Survey, uses of sampling, merits and demerits of sampling, sampling and non-sampling errors.

  
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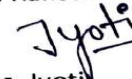
  
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**Types of sampling:** Judgement, probability and mixed sampling, selection of simple random samples, simple random sampling SRS (with and without replacement): estimation of variance of sample mean under SRS with and without replacement.

### Section-B

**Stratified random sampling:** Need for using stratified random sampling, Proportional, Neyman and optimum allocations, estimate of population mean and its variance, principle advantage of stratified random sampling.

**Systematic sampling:** Estimate of population mean and its variance, comparison with stratified and simple random sampling.

### Recommended and Suggested Readings:

1. Gupta, S. C., Kapoor, V. K.: Fundamentals of Mathematical Statistics, Sultan Chand & Sons Educational Pub. New Delhi, 2019.
2. Gun, A.M., Gupta, M. K. and Dasgupta, B.: Fundamentals of Statistics, Vol. I, World Press Pvt. Ltd., 2013.
3. Gun, A.M., Gupta, M. K. and Dasgupta, B.: An outline of Statistical Theory Vol.-II, World Press Pvt. Ltd., 2016.
4. William G. Cochran: Sampling Techniques, Edition 3<sup>rd</sup> 1977.

### Teaching Learning Activities:

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## B. Sc. Hons. Mathematics (Session: 2023-24)

### BSHMATGE 305(P): PRACTICALS OF SAMPLING TECHNIQUES

L T P  
0 0 2

Credits:2(=4Hours)

Duration: 40 hrs

External Evaluation: 50

#### Instructions for the paper setter and the candidates

The setting and evaluation will be done by a board of examiners consisting of Head, External examiner and the teacher(s) involved with the teaching of this paper.

The practical paper will consist of four exercises and the candidates will be required to attempt any three exercises. Use of scientific non-programmable calculator is allowed.

The break-up of marks for the University Examination will be as under:

Numerical Problems: 25

Lab. Record: 10

Viva-voce: 15

Time of the exam will be 1.30 hrs.

#### Lab Course:

The examination will be based on the syllabus of the papers BSHMATGE 305 E(i): Sampling Techniques

#### LIST OF PRACTICALS:

1) Examples Based on:

- Simple random sampling with replacement
- Simple random sampling without replacement
- Stratified sampling
- Systematic sampling

#### Teaching Learning Activities:


**Assignments:** Class assignments focus on strong foundation of conceptual knowledge, better understanding of the subject and development of problem solving and analytical skills.

**Quizzes:** Quizzes are organized to build the bridge between theoretical (conceptual knowledge) and practical applications of the learned concepts.

  
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## B. Sc. Hons. Mathematics (Session: 2023-24)

**Group Discussion:** Group discussions are conducted to develop and boost the self confidence, competitive aptitude and enhance the problem solving and analytical skills.

**Guest lectures:** Guest lectures are conducted for overall development of students and strong foundation of subject

### Semester-IV BSHMATGE405: Applied Statistics

L T P  
4 0 0

Duration- 60 hrs  
External Evaluation: 75  
Internal Assessment: 25  
Pass marks 40%

**Course Objectives:** This course gives knowledge about vital statistics and Measurement of Fertility. It gives introduction about description and Construction of Life Table and its Uses. Students will also be able to check the quality of the product. They will also be aware about various errors in the product quality.

**Course Learning Outcomes:** Upon completion of this course, students should be able to:

- Understand the concept of SQC, Process Control, Product Control, Producer's & Consumer's Risks,  $3-\sigma$  Control Limits, Tolerance and Specification limits.
- Understand the applications of d-Chart, p-Chart, c-Chart
- Obtain Vital Statistics. Measures fertility rate and mortality rate.
- Understand the construction of Life Tables and its uses.

### INSTRUCTIONS FOR THE PAPER SETTER/CANDIDATES

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### Section-A

  
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**Statistical Quality Control:** Definition, basics of SQC and its benefits, chance and assignable causes, process and product control, major parts of control charts for process control, three sigma control limits, tolerance and specification limits.

Shewhart's Control Charts for mean, S.D. and range, control charts for number of defectives (d-chart) and fraction defective (p-chart), control chart for number of defects (c-chart) (Applications only).

### Section-B

**Vital Statistics:** Introduction, Methods and Uses of Vital Statistics, Measurement of Population Rates and Ratio of Vital Events, Measurement of Fertility: Crude Birth Rate, General Fertility Rate, Specific Fertility Rate, Total Fertility Rate. Measurement of Mortality: Crude Death Rate, Infant Mortality Rate, Standardized Death Rate and Causes of Death Rate.

**Life (mortality) tables:** concept of life tables and cohorts, its assumptions and its uses, meanings of different columns of a life table and their inter relationships.

### RECOMMENDED AND SUGGESTED READINGS:

1. S. C. Gupta & V. K. Kapoor, Fundamentals of Applied Statistics, Sultan Chand & Sons Educational Pub. New Delhi, 2019.
2. Swarup, Kanti, Gupta, P. K. and Manmohan: Operation Research, Sultan Chand and Sons, New Delhi, Edition 15<sup>th</sup>, 2010.
3. Gupta, P. K. and Hira, D.S.: Operation Research, Sultan Chand and Sons, New Delhi, Edition 5<sup>th</sup>, 2014.
4. Gun, A.M., Gupta, M. K. and Dasgupta, B.: An outline of Statistical Theory Vol.-II, World Press Pvt. Ltd., 2016.
5. Sharma, S. D.: Operations Research, KedarNath Ram Nath, India, Edition 15<sup>th</sup>, 2010.

### Teaching Learning Activities:

  
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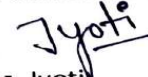
  
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## B. Sc. Hons. Mathematics (Session: 2023-24)

### BSHMATGE405(P): Practical of Applied Statistics

L T P  
0 0 2

Credits:2(=4Hours)

Duration: 40 hrs

External Evaluation: 50

#### Instructions for the paper setter and the candidates

The setting and evaluation will be done by a board of examiners consisting of Head, External examiner and the teacher(s) involved with the teaching of this paper.

The practical paper will consist of four exercises and the candidates will be required to attempt any three exercises. Use of scientific non-programmable calculator is allowed.

The break-up of marks for the University Examination will be as under:

Numerical Problems: 25

Lab. Record: 10

Viva-voce: 15

Time of written exam will be 1.30 hrs.

#### Lab Course:

The examination will be based on the syllabus of the papers BSHMATGE 405E(i): Applied statistics

#### LIST OF PRACTICALS:

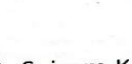
1. Examples based on
  - a) Crude Birth Rate,
  - b) General Fertility Rate,
  - c) Specific Fertility Rate,
  - d) Total Fertility Rate.
  - e) Crude Death Rate,
  - f) Infant Mortality Rate,
  - g) Standardized Death Rate
2. Examples based on
  - a)  $\bar{X}$  and R
  - b) d-chart
  - c) p-chart
  - d) c-chart

  
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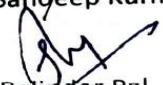
  
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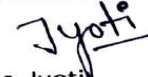
  
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