



AC ITEM NO. _____

Semester	Paper	Theory/Practical	Code
I	I	Theory	UGSC1STA0122
I	I	Practical	UGSC1STAP122
II	I	Theory	UGSC2STA0122
II	I	Practical	UGSC2STAP122
I	II	Theory	UGSC1STA0222
I	II	Practical	UGSC1STAP222
II	II	Theory	UGSC2STA0222
II	II	Practical	UGSC2STAP222

Syllabus in the course

F. Y. B. Sc. Semester I and II

To be implemented from Academic Year
2022-23

By

The Board of Studies in

Statistics

1. Preamble:

The current syllabus of three-year B. Sc. degree programme in Statistics is enclosed in such a way that at the end of this course students can apply statistical tools wisely to draw appropriate conclusions from data. There are mainly two branches of statistics viz. descriptive statistics and inferential statistics which are applied in decision making. To start with, students will learn descriptive statistics first followed by inferential statistics so that after the completion of B. Sc. Statistics programme they can effectively apply statistical techniques to solve real life problems.

Two semesters of first year of B. Sc. programme (two papers) focuses on types of data, tabulation, classification, correlation, regression, time series analysis, index numbers, probability, testing of hypothesis, etc. along with their practical applications using MS excel and R software.

2. Objectives:

To make students aware about the basic concepts required for further studies in the subject of statistics. This course has introduced various statistical tools like measures of central tendency, measures of dispersion, correlation, regression analysis, testing of hypothesis, probability theory, etc.

3. Expected Outcome:

A. Program outcome:

B.Sc. Statistics course is going to help students to understand the world of data analytics along with handling of real-world problems. Various computer software will help them in analyzing data to draw conclusions based on the problem under consideration. Statistical practical based on real world problem will develop their ability to interpret the data which will boost their confidence while working in corporate world. This course is designed in such a way that it will motivate them to chase careers in related fields like big data analytics, pharmaceuticals, financial statistics and actuarial sciences, etc.

B. Program Specific Outcomes

This course is mainly focuses on descriptive statistics and different statistical methods to be used in further analysis.

C. Course Outcome:

At the end of the course, students should have the knowledge and understanding of:

1. Types of data, data condensations, representation, classification, tabulation and graphical representation of data
2. Various measures of central tendencies, types and their applications in real world
3. Various measures of dispersion, types and their applications in real world

4. Correlation and regression analysis and their applications
5. Probability calculations and different types of probability distributions along with their applications, testing of hypothesis, etc.

4. Course Contents (syllabus):

Couse Code: UGSC1STA0122 Semester I Paper I DESCRIPTIVE STATISTICS-1	
	Lectures
<p>Unit I - Types of Data and Data Condensation:</p> <ul style="list-style-type: none"> • Definition and scope of Statistics • Types of Characteristics, Different types of scales: nominal, ordinal, interval and ratio. Concept of Linkert scale • Collection of Primary data: concept of a questionnaire and a schedule, Secondary data • Types of data: Qualitative and quantitative data; Time series data and cross section data, discrete and continuous data. • Tabulation. • Dichotomous classification- for two and three attributes, Verification for consistency, ultimate class frequencies, fundamental set of class frequencies • Association of attributes: Yule’s coefficient of association Q. Yule’s coefficient of Colligation γ, relationship between Q and γ as: $Q \geq \gamma$, $0 \leq \gamma \leq Q \leq 1$ <p>(Ref. 1, 2, 3, 4, 6, 11, 13)</p>	15
<p>Unit II–Classification of Data and Measures of central tendency</p> <p>i) Classification of Data</p> <ul style="list-style-type: none"> • Univariate frequency distribution of discrete and continuous variables. Cumulative frequency distribution. • Graphical representation of frequency distribution by Histogram, frequency polygon, Cumulative frequency curve. Stem and leaf diagram. <p>ii) Measures of central tendency</p> <ul style="list-style-type: none"> • Concept of central tendency of data. Requirements of good measure • Locational averages: Median, Mode, and Partition Values: Quartiles, Deciles, and Percentiles. Graphical representation of mode, median and partition values. Effect of change of origin and scale on arithmetic mean. 	15

<ul style="list-style-type: none"> • Mathematical averages Arithmetic mean (Simple, weighted mean, combined mean), Geometric mean, Harmonic mean, relation between Geometric mean, Harmonic mean. Arithmetic mean • Geometric mean of ratio of two series is the ratio of their geometric means • Empirical relation between mean, median and mode • Merits and demerits of using different measures & their applicability <p>(Ref. 1, 2, 3, 4, 11, 13)</p>	
<p>Unit III - Measures of Dispersion, Skewness & Kurtosis</p> <ul style="list-style-type: none"> • Concept of dispersion. Requirements of good measure. • Absolute and Relative measures of dispersion: Range, Quartile Deviation, Mean absolute deviation, Standard deviation, • Variance and Combined variance, raw moments and central moments and relations between them. Their properties. • Concept of Skewness and Kurtosis: Measures of Skewness: Karl Pearson's, Bowley's and Coefficient of skewness based on moments. Measures of Kurtosis • Box Plot <p>(Ref. 1, 2, 3, 4, 11, 13)</p>	15
<p>Couse Code: UGSC2STA0122 Semester II Paper I DESCRIPTIVE STATISTICS-II</p>	
	Lectures
<p>UNIT – I: Correlation and regression analysis</p> <ul style="list-style-type: none"> • Scatter Diagram, product moment correlation coefficient and its properties. Spearman's Rank correlation (With and without ties) • Concept of linear regression, principle of least squares, fitting a straight line by method of least squares. Derivation for acute angle between the two lines of regression. • Relation between regression coefficients and correlation coefficient. • Fitting of curves reducible to linear form by transformation. Concept and use of coefficient of determination (R^2). • Fitting a quadratic curve by method of least squares. <p>(Ref. 1, 2, 3, 4, 10, 11, 13)</p>	15
<p>UNIT – II : Time Series</p> <ul style="list-style-type: none"> • Definition of time series. Its component. Models of time series. • Estimation of trend by: i) Freehand curve method ii) Method of semi average iii) Method of Moving average iv) Method of least squares 	15

<p>(linear trend only)</p> <ul style="list-style-type: none"> • Estimation of seasonal component by i) method of simple average ii) Ratio to moving average iii) Ratio to trend method. <p>(Ref. 1, 2, 3, 9, 12, 13)</p>	
<p>Unit III - Index Numbers</p> <ul style="list-style-type: none"> • Index numbers as comparative tool. Stages in the construction of Price Index Numbers. • Measures of Simple and Composite Index Numbers. Laspeyre's, Paasche's, Marshal-Edgeworth's, Dobisch & Bowley's and Fisher's Index Numbers formula. • Quantity Index Numbers and Value Index Numbers, Time reversal test, Factor reversal test, Circular test. • Fixed base Index Numbers, Chain base Index Numbers. Base shifting, splicing and deflating. • Cost of Living Index Number. Concept of Real Income based on Wholesale Price Index Number <p>(Ref. 1, 2, 9, 12)</p>	15
<p>Course Code: UGSC1STAP122</p> <p>SEMESTER I : Practicals Paper I using Excel and Calculator</p> <ol style="list-style-type: none"> 1. Classification and Tabulation 2. Analysis of Univariate Bivariate Data 3. Graphs and Diagram 4. Measures of central tendency 5. Measures of dispersion 6. Skewness and Kurtosis 	
<p>Course Code: UGSC2STAP122</p> <p>SEMESTER II: Practicals Paper I using Excel and Calculator</p> <ol style="list-style-type: none"> 1. Correlation analysis 2. Regression analysis 3. Fitting of curve 4. Time series 	

5. Index number-I	
6. Index number-II	
Couse Code: UGSC1STA0222 Semester I Paper II STATISTICAL METHODS-1	
	Lectures
Unit : 1 Probability Theory : <ul style="list-style-type: none"> • Definition : Trial, random experiment, sample point and sample space. • Definition of an event and different types of event : compound event, complementary event, equally likely events, certain event, impossible event, mutually exclusive, exhaustive events. • Different definitions of Probability: Classical (Mathematical) and Empirical definitions of Probability and their properties. • Conditional probability. • Independence of events, pairwise and mutual independence of three events. • Theorems and their applications : <ul style="list-style-type: none"> i. Addition theorem on probability for two and three events ii. Multiplication theorem on probability for two events. iii. Bayes' theorem (Ref. 1,2 5,6)	15
Unit : 2 Concept of Discrete & Continuous random variables and properties of their probability distributions : <ul style="list-style-type: none"> • Random variable. Definition and properties of probability distribution and cumulative distribution function of discrete and continuous random variables. • Raw and Central moments (definition only) and their relationship. (upto order four). • Concepts of Skewness and Kurtosis and their uses. • Expectation of a random variable. Theorems on Expectation & Variance. Properties of Expectation and variance. • Joint probability mass function of two discrete random variables. • Marginal and conditional distributions. • Covariance and Coefficient of Correlation. Independence of two random variables. (Ref. 1,2,3,5,6)	15
Unit : 3 Discrete probability Distributions: <ul style="list-style-type: none"> • Definition and derivation of mean and variance of the following distributions: <ul style="list-style-type: none"> i. Discrete Uniform distribution 	15

<ul style="list-style-type: none"> ii. Bernoulli and Binomial distributions iii. Poisson distribution iv. Hypergeometric distribution <ul style="list-style-type: none"> • Recurrence relation for probabilities of Binomial and Poisson distributions. • Poisson approximation to Binomial distribution. • Binomial approximation to Hyper geometric distribution. <p>(Ref.1,2,5,6)</p>	
Couse Code: UGSC2STA0222 Semester II Paper II STATISTICAL METHODS-II	
	Lectures
UNIT :1 Continuous Probability Distributions: <ul style="list-style-type: none"> • Concept of continuous random variable and properties of its probability distribution • Definition and derivation of mean, variance and median of Uniform and Exponential distributions. Memory less property of Exponential distribution. • Normal distribution. Properties of Normal distribution (without proof). Normal approximation to Binomial and Poisson distribution (statement only). Properties of Normal curve. Use of normal tables. <p>(Ref. 1,2,6)</p>	15
Unit 2 Estimation : <ul style="list-style-type: none"> • Sampling from a distribution : Concept of a statistic, estimate and its sampling distribution. Parameter and it's estimator. • Concept of bias and standard error of an estimator. • Central Limit theorem (statement only). • Sampling distribution of sample mean and sample proportion. (For large sample only) • Standard errors of sample mean and sample proportion. • Point and Interval estimate of single mean, single proportion from sample of large size. <p>(Ref1,2,3,6)</p>	15
UNIT III: Testing of Hypothesis and Large sample test	
Testing of hypothesis: <ul style="list-style-type: none"> (a) Concept of hypothesis (b) Null and alternate hypothesis 	

<p>(c) Types of error, critical region, Level of significance</p> <p>Large sample tests:(using central limit theorem if necessary)</p> <p>(a) For testing specific value of population mean (b) For testing specific value in difference of two means (c) For testing specific value of population proportion (d) For testing specific value of difference of population proportion (development of critical region is not expected) (e) Use of central limit theorem</p> <p>(Ref. 1,2,3,4,6)</p>	
<p>Course Code: UGSC1STAP222</p> <p>SEMESTER I : Practicals Paper II using Excel and Calculator</p> <ol style="list-style-type: none"> 1. Probability 1 2. Probability 2 3. Univariate Discrete random variable 4. Bivariate Discrete random variable 5. Binomial Distribution 6. Poisson Distribution 7. Hypergeometric Distribution 	
<p>Course Code: UGSC2STAP222</p> <p>SEMESTER II: Practicals Paper II using Excel and Calculator</p> <ol style="list-style-type: none"> 1. Continuous Random Variable 2. Uniform and Exponential Distribution 3. Normal Distribution and application of central limit theorem 4. Estimation 5. Testing of Hypothesis 6. Large Sample Tests 	
<p>5. <u>Proposed reading Material / Bibliography:</u></p> <ol style="list-style-type: none"> 1 Medhi J. : Statistical Methods, An Introductory Text, Second Edition, 	

<p>New Age International Ltd.</p> <p>2 Agarwal B. L.: Basic Statistics, New Age International Ltd.</p> <p>3 Spiegel M. R. : Theory and Problems of Statistics, Schaum’s Publications series. Tata McGraw-Hill.</p> <p>4 Kothari C. R. : Research Methodology, Wiley Eastern Limited.</p> <p>5 David S. : Elementary Probability, Cambridge University Press.</p> <p>6 Hoel P. G. : Introduction to Mathematical Statistics, Asia Publishing House.</p> <p>7 Hogg R. V. and Tannis E.P. : Probability and Statistical Inference McMillan Publishing Co. Inc.</p> <p>8 Pitan Jim : Probability, Narosa Publishing House.</p> <p>9 Goon A. M., Gupta M. K., Dasgupta B. : Fundamentals of Statistics, Volume II : The World Press Private Limited, Calcutta.</p> <p>10 Miller I. & Miller M (2006), John E. Freund’s Mathematical Statistics with applications, 7th edition, Pearson Education Asia</p> <p>11 Gupta, S. C. and Kapoor, V. K. (2002), Fundamentals of Mathematical Statistics, eighth Edition, Sultan Chand and Sons Publishers, New Delhi.</p> <p>12 Gupta, S. C. and Kapoor, V. K. (2004), Fundamentals of Applied Statistics, Third Edition, Sultan Chand and Sons Publishers, New Delhi.</p> <p>13 Sarma, K. V. S. (2001). Statistics Made it Simple: Do it yourself on PC. Prentice Hall of India, New Delhi.</p>																
<p>6. Examination pattern (Internal) (40 Marks):</p> <table border="1" data-bbox="203 1453 1304 1640"> <thead> <tr> <th>Paper</th> <th>Assignment</th> <th>Class Test</th> <th>Overall Class Performance, participation, attendance</th> <th>Total</th> </tr> </thead> <tbody> <tr> <td>I</td> <td>20</td> <td>10</td> <td>10</td> <td>40</td> </tr> <tr> <td>II</td> <td>20</td> <td>10</td> <td>10</td> <td>40</td> </tr> </tbody> </table>	Paper	Assignment	Class Test	Overall Class Performance, participation, attendance	Total	I	20	10	10	40	II	20	10	10	40	
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I	20	10	10	40												
II	20	10	10	40												

7. Theory Paper Pattern (Semester End) (60 Marks) per Paper:

Unit No.	Q. No.	Question Type	Marks
I	1	Short/Long answers	20
II	2	Short/Long answers	20
III	3	Short/Long answers	20
		Total Marks	60

Practical Paper Pattern (Semester End) (50 Marks) per Paper:

Unit No.	Q. No.	Written Exam Question Type	Marks	Journal
I	1	Short/Long answers	10	10
II	2	Short/Long answers	10	
III	3	Short/Long answers	10	
I/II/III	4	Short/Long answers	10	
		Total Marks	50	

8. Members of the Board of Studies:

The following Members constitute the BOS Statistics:

- Shri. Sanjay Karande (Chairman)
- Dr. Sucheta Ketkar
- Dr. Asha Jindal
- Dr. Leena Kulkarni
- Dr. Santosh Gite
- Smt. Vrinda Kanitkar
- Shri. Anil Pasi
- Smt. Pragati Date
- Smt. Vasanti Todakar
- Shri. Abhishek Bandiwadekar
- Smt. Poonam Kadam