



**SOPHIA COLLEGE, (AUTONOMOUS)**

Affiliated to

**UNIVERSITY OF MUMBAI**

**Programme: STATISTICS**

**Programme Code: SBASTT**

F.Y.B.A.

2022-23

(Choice Based Credit System with effect from the year 2018-19)

### Programme Outline: FYBA (SEMESTER I)

Course Code	Unit No	Name of the Unit	Credits
SBASTT101		DESCRIPTIVE STATISTICS-1	2
	1	Types of Data and Data Condensation	
	2	Types of Data and Data Condensation Classification of Data and Measures of central tendency	
	3	Measures of Dispersion, Skewness & Kurtosis	
SBASTTP1		STATISTICS PRACTICAL	1
	1.	Descriptive Statistics-1 based on the syllabus.	

### Programme Outline: FYBA (SEMESTER II)

Course Code	Unit No	Name of the Unit	Credits
SBASTT201		DESCRIPTIVE STATISTICS-2	2
	1	Correlation and regression analysis	
	2	Time Series	
	3	Index Numbers	
SBASTTP2		STATISTICS PRACTICAL	1
	1.	Descriptive Statistics-2 based on the syllabus.	

### Preamble:

In the current context, possessing a solid understanding of various statistical concepts has become crucial. Statisticians are constantly in demand in the software, research, industry, and education sectors. The various statistics course syllabi have been designed so that students can become competent in an extensive spectrum of statistical processes at the completion of each course. These techniques can be applied to further research while also applying statistical tools appropriately to a diversity of data sets in order to derive some reliable results.

Different environments require for different applications of statistics. Quantitative results in various areas of research are referred to as statistics. The study of statistics is an important domain of knowledge that focuses on various techniques of collecting, presenting, analyzing, and interpreting data. It is the science of data-driven learning. The subject provides tools to facilitate decision-making in uncertain situations. Decision-making can be rendered simpler by statistics, which measures uncertainties and chance. In addition to building the foundations for the development of essentially every contemporary field, its descriptive and inferential responsibilities offer a variety of unconventional career possibilities, from financial analysis to sports analysis. The main goal of the curriculum is to get students ready to enter into a promising professional life even after graduation.

Large volumes of data have been processed by computers over the past 20 years, and more complex methods of statistical analysis may be applied efficiently resulting in reliable results. Therefore, a number of fields, including agriculture, business, management, economics, finance, insurance, education, biotechnology, and medical science, among others, rely heavily on statistical techniques and procedures.

Statistics can be divided into three broad categories, (1) descriptive statistics, which summarizes and describes data; (2) inferential statistics, that arrives at decisions about the population based on sample; and (3) operations research, that utilizes statistics in the fields of industrial and management.

### **PROGRAMME OBJECTIVES**

<b>PO 1</b>	To teach students methods for effective data collection, organization, and summarization skills as well as analysis and interpretation approaches.
<b>PO 2</b>	Introduce students to regression analysis to model relationships between variables and make predictions.
<b>PO 3</b>	To provide students with a understanding of fundamental concepts - probability, random variables, and distributions.
<b>PO 4</b>	Encourage students to use statistical techniques to solve practical issues and assess the reliability of statistical findings in order to develop their critical thinking abilities.

### **PROGRAMME SPECIFIC OUTCOMES**

<b>PSO 1</b>	The learner will be able to understand the fundamentals of statistics, including the key concepts of probability theory, probability distributions, distribution theory, statistical inference, significance testing, and operations research.
<b>PSO 2</b>	The learner will be able apply the concepts taught in the practicals and will be able to analyse and evaluate data as well as come to reliable conclusions. This will prepare pupils for real-world situations.
<b>PSO 3</b>	Apply statistical, operations research, probability theory, time series, designs of experiments, and other principles to real-world issues.
<b>PSO 4</b>	Know how statistics are used in fields like finance, sociology, science, and economics, among others.

**SEMESTER 1**

NAME OF THE COURSE	DESCRIPTIVE STATISTICS-1	
CLASS	FYBA	
COURSE CODE	SBASTT101	
NUMBER OF CREDITS	2	
NUMBER OF LECTURES PER WEEK	3	
TOTAL NUMBER OF LECTURES PER SEMESTER	45	
EVALUATION METHOD	INTERNAL ASSESSMENT	SEMESTER END EXAMINATION
TOTAL MARKS	50	50
PASSING MARKS	20	20

**COURSE OBJECTIVES:**

CO 1.	To introduce the techniques of data collection and its presentation.
CO 2.	To emphasize the need for numerical summary measures for data analysis.
CO 3.	To learn to present the data graphically.
CO 4,	To understand and apply the descriptive techniques of statistical analysis to

**COURSE LEARNING OUTCOMES:**

CLO 1.	The learner will be able to distinguish between different types of scales of the characteristics.
CLO 2.	The learner will be able to compare the different types of data and describe various methods of data collection.
CLO 3.	The learner will be able to construct Univariate and Bivariate frequency distribution , Cumulative frequency distribution.
CLO 4.	The learner will be able to create appropriate graphical representation of the given data.
CLO 5.	The learner will be able to compute and interpret the relation between the qualitative characteristics in the data.
CLO 6.	The learner will be able to comprehend , compute and interpret the measures of central tendency and dispersion.
CLO 7.	The learner will be able to identify the nature of skewness and kurtosis of the data - mathematically & graphically.

UNIT 1	Types of Data and Data Condensation (15 LECTURES)
1.1	Concept of population and sample. Finite ,Infinite population ,Notion of SRS SRSWOR and SRSWR
1.2	Types of Characteristics, Different types of scales: nominal, ordinal, interval and ratio
1.3	Collection of Primary data: concept of a questionnaire and a schedule, Secondary data
1.4	Types of data: Qualitative and quantitative data; Time series data and cross section data, discrete and continuous data
1.5	Tabulation and Uni-variate frequency distribution of discrete and continuous variables. Cumulative frequency distribution, Bi-variate frequency distribution
1.6	Dichotomous classification- for two and three attributes, Verification for Consistency and Diagrams, Representation of data using bar diagrams(Simple, Multiple, Segmented and Percentage) , Pie diagram.
1.7	Association of attributes: Yule's coefficient of association Q. Yule's coefficient of Colligation.
UNIT 2	Graphical representation and Measures of central tendency (15 LECTURES)
2.1	Graphical representation of frequency distribution by Histogram, frequency polygon, Cumulative frequency curve. Stem and leaf diagram.
2.2	a)Concept of central tendency of data. Requirements of good measure b) Locational averages: Median, Mode, and Partition Values: Quartiles, Deciles, and Percentiles. c) Mathematical averages Arithmetic mean (Simple, weighted mean, combined mean), Geometric mean, Harmonic mean, d) Empirical relation between mean, median and mode. e) Merits and demerits of using different measures & their applicability.
UNIT 3	Measures of Dispersion, Skewness & Kurtosis (15 LECTURES)
3.1	a)Concept of dispersion. Requirements of good measure. b) Absolute and Relative measures of dispersion: Range, Quartile Deviation, Mean absolute deviation, Standard deviation. c) Variance and Combined variance, raw moments and central moments and relations between them and their properties d) Concept of Skewness and Kurtosis: Measures of Skewness: Karl Pearson's, Bowley's and Coefficient of skewness based on moments. Measure of Kurtosis, e) Box Plot.

### **References:**

- Agarwal B.L.: Basic Statistics, New Age International Ltd.
- Spiegel M.R. : Tehory and Problems of Statistics, Schaum's Publications series, Tata Mc-Graw Hill
- Kothari C.R. : Research Methodology: Wiley Eastern Limited.
- Goon A.M. , Gupta M.K., Dasgupta B. : Fundamentals of Statistics, Volume II: The World Press Private Limited, Calcutta

NAME OF THE COURSE	STATISTICS PRACTICALS	
CLASS	FYBA	
COURSE CODE	SBASTTP1	
NUMBER OF CREDITS	1	
NUMBER OF LECTURES PER WEEK	3	
TOTAL NUMBER OF LECTURES PER SEMESTER	45	
EVALUATION METHOD	INTERNAL ASSESSMENT	SEMESTER END EXAMINATION
TOTAL MARKS	10	40
PASSING MARKS	-	20

UNIT 1	DESCRIPTIVE STATISTICS-1 (15 SESSIONS)
1.1	Tabulation
1.2	Attributes
1.3	Classification of Data
1.4.	Diagrammatic representation.
1.5	Measures of central tendency
1.6	Measures of dispersion
1.7	Practical using Excel and R i)Classification of Data and Diagrammatic representation. ii)Measures of central tendency iii)Measures of dispersion

### ASSESSMENT DETAILS:

#### Internal Assessment (50 marks)

One written test of 25 mark and one project work of 25 mark.

#### Semester End Examination – External Assessment (50 marks)

At the end of the semester, Theory examination of 2 hours duration and 50 marks based on the three units shall be held for each course.

Pattern of **Theory question** paper at the end of the semester for **each course**.

Questions	Sub-questions	Maximum marks
Q1	Part A: two theory sub-questions each one is of 6 marks and attempt any one. Part B: Three sub-questions, each one is of 4 marks and attempt any two.	14 each
Q2		
Q3		
Q4	There shall be 3 sub-questions each one is of 4 marks and attempt any 2.	8
Total marks		50

#### Practical Assessment (for papers with practicals)

- The duration of the practical exam will be two hours.
- The students are allowed to write the paper if the attendance for practicals is more than 75%
- To appear in the practical exam, students must bring a properly certified journal.

**Programme Outline: FYBA (SEMESTER II)**

Course Code	Unit No	Name of the Unit	Credits
SBASTT201		DESCRIPTIVE STATISTICS--2	2
	1	Correlation and regression analysis	
	2	Time Series	
	3	Index Numbers	
SBASTTP2		STATISTICS PRACTICAL	1
	1.	DESCRIPTIVE STATISTICS—2 based on the syllabus.	

**SEMESTER 2**

NAME OF THE COURSE	DESCRIPTIVE STATISTICS-2	
CLASS	FYBA	
COURSE CODE	SBASTT201	
NUMBER OF CREDITS	1	
NUMBER OF LECTURES PER WEEK	3	
TOTAL NUMBER OF LECTURES PER SEMESTER	45	
EVALUATION METHOD	INTERNAL ASSESSMENT	SEMESTER END EXAMINATION
TOTAL MARKS	50	50
PASSING MARKS	20	20

**COURSE OBJECTIVES:**

CO 1.	To understand the nature and magnitude of relationship between the quantitative characteristics in the data.
CO 2.	To create suitable mathematical models that best represents the data given.
CO 3.	To enable the learners to understand forecasting techniques to predict trend and seasonal variation in the time series.
CO 4.	To enable the learners to understand the construction of index numbers & its applications in various field.

**COURSE LEARNING OUTCOMES:**

CLO 1.	The learner will be able to compute the numerical measures to identify the direction and strength of linear relationship between two variables.
CLO 2.	The learner will be able to build a simple linear regression model and interpret regression coefficients and coefficient of determination.
CLO 3.	The learner will be able to identify the relevant mathematical model which fits the data
CLO 4.	The learner will be able to identify various components of time series.
CLO 5.	The learner will be able to apply the appropriate methods to evaluate the impact of the different components of time series on the data.
CLO 6.	The learner will be able to comprehend the construction of different index numbers and to apply the methods in different situations.

UNIT 1	Correlation and regression analysis (15 LECTURES)
1.1	Scatter Diagram, Product moment correlation coefficient and its properties.
1.2	Spearman's Rank correlation.(With and without ties)
1.3	Concept of linear regression. Principle of least squares. Fitting a straight line by method of least squares.
1.4	Relation between regression coefficients and correlation coefficient. Concept
1.5	Fitting a quadratic curve by method of least squares.
1.6	Fitting of curves reducible to linear form by transformation.
UNIT 2	Time Series (15 LECTURES)
2.1	Definition of time series and its component. Models of time series.
2.2	Estimation of trend by: i) Freehand curve method ii) method of semi average iii)Method of Moving average iv) Method of least squares(linear trend only)
2.3.	Estimation of seasonal component by i) method of simple average ii) Ratio to moving average iii)Ratio to trend method (iv) Link Relative Method
UNIT 3	Index Numbers (15 LECTURES)
3.1	Index numbers as comparative tool. Stages in the construction of Price Index numbers.
3.2	Fixed base Index Numbers, Chain base Index Numbers. Base shifting, splicing
3.3	Composite & Weighted Index Numbers. Laspeyre's, Paasche's, Marshal-Edgeworth's, Dorbisch & Bowley's and Fisher's Index Numbers formula.
3.4	Quantity Index Numbers and Value Index Numbers Time reversal test, Factor reversal test, Circular test.
3.5	Cost of Living Index Number, Concept of Real Income based on Wholesale Price Index Number , deflating.
3.6	Index numbers as comparative tool. Stages in the construction of Price Index numbers.
3.7	Fixed base Index Numbers, Chain base Index Numbers. Base shifting, splicing

### References:

- Agarwal B.L.: Basic Statistics, New Age International Ltd.
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NAME OF THE COURSE	STATISTICS PRACTICALS	
CLASS	FYBA	
COURSE CODE	SBASTTP2	
NUMBER OF CREDITS	1	
NUMBER OF LECTURES PER WEEK	3	
TOTAL NUMBER OF LECTURES PER SEMESTER	45	
EVALUATION METHOD	INTERNAL ASSESSMENT	SEMESTER END EXAMINATION
TOTAL MARKS	10	40
PASSING MARKS	-	20

UNIT 1	DESCRIPTIVE STATISTICS-2 (15 SESSIONS)
1.1	Correlation analysis
1.2	Regression analysis
1.3	Fitting of curve
1.4.	Time series
1.5	Index number-I
1.6	Index number-II
1.7	Practical using Excel and R i) Correlation analysis ii) Regression analysis iii) Fitting of curve

### ASSESSMENT DETAILS:

#### Internal Assessment (50 marks)

The IA consists of test/project of 20 marks and class participation of 5 marks

#### Semester End Examination – External Assessment (50 marks)

At the end of the semester, Theory examination of 2 hours duration and 50 marks based on the three units shall be held for each course.

Pattern of **Theory question** paper at the end of the semester for **each course**.

- There shall be four questions, first three questions shall be of 20 marks on each unit and fourth question will be of 15 marks based on Unit I,II and Unit III.
- All questions shall be compulsory with internal choice within the questions.

Questions	Sub-questions	Maximum marks
Q1	Part A: two theory sub-questions each one is of 6 marks and attempt any one. Part B: Three sub-questions, each one is of 4 marks and attempt any two.	14 each
Q2		
Q3		
Q4	There shall be 3 sub-questions each one is of 4 marks and attempt any 2.	8
Total marks		50

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