SOPHIA COLLEGE (AUTONOMOUS)

Affiliated to the University of Mumbai

Programme: Science

Statistics (Minor)

Theory Course Code: SSTA111MN

Practical Course Code: SSTA111MNP

Syllabus for the Academic Year 2023-2024

based on the National Education Policy 2020

SOPHIA COLLEGE (AUTONOMOUS)

PROGRAMME SPECIFIC OUTCOMES	
1	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.
2	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.
3	Apply statistical, operations research, probability theory, time series, designs of experiments, and other principles to real-world issues.
4.	Know how statistics are used in fields like finance, sociology, science, and economics, among others.

DEPARTMENT OF MATHEMATICS & STATISTICS

COURSE DETAILS FOR MINOR:

	SEMESTER 1		SEMESTER 2
TITLE	**DESCRIPTIVE STATISTICS-1**		**DESCRIPTIVE STATISTICS-2**
TYPE OF COURSE DSC/DSE	**DSC**		**DSC**
CREDITS	**4**		**4**

Programme: Science Statistics Minor	**Semester – 1**
Course Title: Descriptive Statistics-1	**Course Code: SSTA111MN**

COURSE OBJECTIVES:

- To introduce the techniques of data collection and its presentation.
- To emphasize the need for numerical summary measures for data analysis.
- To learn to present the data graphically.
- To understand and apply the descriptive techniques of statistical analysis to the given data

COURSE OUTCOMES:

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Through this paper, the learner will be able to

1. Distinguish between different types of scales of the characteristics.
2. Compare the different types of data and describe various methods of data collection.
3. Construct Univariate and Bivariate frequency distribution , Cumulative frequency distribution.
4. Create appropriate graphical representation of the given data.
5. Compute and interpret the relation between the qualitative characteristics in the data.
6. Comprehend , compute and interpret the measures of central tendency and dispersion.
7. Identify the nature of skewness and kurtosis of the data -mathematically & graphically.

Lectures per week (1 Lecture is 60 minutes)		**3**	
Total number of Hours in a Semester		**45**	
Credits		**3**	
Evaluation System	**Semester End Examination**	**2 Hours**	**50 marks**
	Internal Assessment	**--**	**50 marks**

UNIT 1	1.1	Concept of population and sample. Finite , Infinite population ,Notion of SRS, SRSWOR and SRSWR.	15 hours
	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; 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	
	1.7	Association of attributes: Yule's coefficient of association Q. Yule's coefficient of Colligation Y, relation between Q and Y(derivation).	

UNIT 2	2.1	Graphical representation of frequency distribution by Histogram, frequency polygon, Cumulative frequency curve.	15 hours
	2.2	**Measures of central tendency** 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	3.1	**Measures of Dispersion:** a) Concept of dispersion. Requirements of good measure. b) Absolute and Relative measures of dispersion: Range, Quartile Deviation, Mean absolute deviation, Variance and Standard deviation. c) 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	15 hours

References:

1. Agarwal B.L.: Basic Statistics, New Age International Ltd.
2. Spiegel M.R. : Tehory and Problems of Statistics, Schaum's Publications series, Tata Mc-Graw Hill
3. Kothari C.R. : Research Methodology: Wiley Eastern Limited.
4. Goon A.M. , Gupta M.K., Dasgupta B. : Fundamentals of Statistics, Volume II: The World Press Private Limited, Calcutta
5. Agarwal, B. L. (2003). Programmed Statistics, Second Edition, New Age International Publishers, New Delhi.
6. Gupta, S. C. and Kapoor, V. K. (1983). Fundamentals of Mathematical Statistics, Eighth Edition, Sultan Chand and Sons Publishers, New Delhi.
7. Gupta, S. C. and Kapoor, V. K. (1997). Fundamentals of Applied Statistics, Third Edition, Sultan Chand and Sons Publishers, New Delhi.
8. Freund, J. E. (1977). Modern Elementary Statistics. Fourth Edition, Prentice Hall of India Private Limited, New Delhi.
9. Purohit, S. G., Gore S. D., Deshmukh S. R. (2008). Statistics Using R, Narosa Publishing House, New Delhi.
10. Sarma, K. V. S. (2001). Statistics Made it Simple: Do it yourself on PC. Prentce Hall of India, New Delhi.

Distribution of the topics for the Practicals (Course Code: SSTA111MNP):

1. Tabulation
2. Attributes
3. Classification of Data
4. Diagrammatic representation.
5. Measures of central tendency
6. Measures of dispersion
7. Practicals using Excel and R

i)Classification of Data and Diagrammatic representation.
ii)Measures of central tendency
iii)Measures of dispersion

ASSESSMENT DETAILS:

SOPHIA COLLEGE (AUTONOMOUS)

I. Internal Assessment (IA): 50 marks

- IA is a separate head of passing.
- A learner should get a minimum of 20 marks out of 50 to be declared PASS in the course.
- 2 activities of 25 marks each
- An additional 25-mark activity will be held ONLY for those who missed any one or both of the 2 activities, due to valid reasons.
- If the learner does not get 20 marks out of 50, the learner will have to appear for the IA ATKT.

II. Semester End Examination (SEE): 50 marks

- SEE is a separate head of passing.
- A learner should get a minimum of 20 marks in SEE to be declared PASS in the course.
- All units of the syllabus will be covered in SEE and will be given equal weightage.
- An additional SEE will be held for those who are absent, due to valid reasons, for the main/regular SEE.
- If the learner does not get 20 marks out of 50, the learner will have to appear for the SEE ATKT.

SOPHIA COLLEGE (AUTONOMOUS)

SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

Affiliated to the University of Mumbai

Programme: Science

Statistics (Minor)

Theory Course Code: SSTA122MN

Practical Course Code: SSTA122MNP

Syllabus for the Academic Year 2023-2024

based on the National Education Policy 2020

SOPHIA COLLEGE (AUTONOMOUS)

PROGRAMME SPECIFIC OUTCOMES	
1	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.
2	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.
3	Apply statistical, operations research, probability theory, time series, designs of experiments, and other principles to real-world issues.
4.	Know how statistics are used in fields like finance, sociology, science, and economics, among others.

DEPARTMENT OF MATHEMATICS & STATISTICS
COURSE DETAILS FOR MINOR:

	SEMESTER 1		SEMESTER 2
TITLE	**DESCRIPTIVE STATISTICS-1**		**DESCRIPTIVE STATISTICS-2**
TYPE OF COURSE DSC/DSE	**DSC**		**DSC**
CREDITS	**4**		**4**

Programme: Science Statistics Minor	**Semester – 1**
Course Title: Descriptive Statistics-1	**Course Code: SSTA111MN**

COURSE OBJECTIVES:

- To enable the learners to understand forecasting techniques to predict trend and seasonal variation in time series.
- To enable the learners to understand the concept of index numbers.

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COURSE OUTCOMES:

Through this paper, the learner will be able to

8. Compute the numerical measures to identify the direction and strength of linear relationship between two variables.
9. Build a simple linear regression model and interpret regression coefficients and coefficient of determination.
10. Identify the relevant mathematical model which fits the data.
11. Identify various components of time series. Apply the appropriate methods to evaluate and eliminate these components.
12. Comprehend the construction and application of different index numbers.

Lectures per week (1 Lecture is 60 minutes)		**3**	
Total number of Hours in a Semester		**45**	
Credits		**3**	
Evaluation System	**Semester End Examination**	**2 Hours**	**50 marks**
	Internal Assessment	**--**	**50 marks**

UNIT 1	1.1	UNIT – I: Correlation and regression analysis Scatter Diagram, Product moment correlation coefficient and its properties. Spearman's Rank correlation.(With and without ties)	15 hours
	1.2	Concept of linear regression. Principle of least squares. Fitting a straight line by method of least squares.	
	1.3	Relation between regression coefficients and correlation coefficient. Concept and use of coefficient of determination (R^2).	
	1.4	Fitting a quadratic curve by method of least squares.	
	1.5	Fitting of curves reducible to linear form by transformation.	
UNIT 2	2.1	Time Series Definition of time series and its component. Models of time series.	15 hours

	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	3.1	Index Numbers a)Index numbers as comparative tool. Stages in the construction of Price Index numbers. b) Fixed base Index Numbers, Chain base Index Numbers. Base shifting, splicing c) Composite & Weighted Index Numbers. Laspeyre's, Paasche's, Marshal-Edgeworth's, Dorbisch & Bowley's and Fisher's Index Numbers formula. d) Quantity Index Numbers and Value Index Numbers Time reversal test, Factor reversal test, Circular test. e) Cost of Living Index Number, Concept of Real Income based on Wholesale Price Index Number , deflating.	15 hours

References:

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

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Distribution of the topics for the Practicals (Course Code: SSTA111MNP):

1. Correlation analysis
2. Regression analysis
3. Fitting of curve
4. Time series
5. Index number-I
6. Index number-II
7. Practical using Excel and R

i) Correlation analysis
ii) Regression analysis
iii) Fitting of curve

ASSESSMENT DETAILS:

III. Internal Assessment (IA): 50 marks

- IA is a separate head of passing.
- A learner should get a minimum of 20 marks out of 50 to be declared PASS in the course.
- 2 activities of 25 marks each
- An additional 25-mark activity will be held ONLY for those who missed any one or both of the 2 activities, due to valid reasons.
- If the learner does not get 20 marks out of 50, the learner will have to appear for the IA ATKT.

IV. Semester End Examination (SEE): 50 marks

- SEE is a separate head of passing.
- A learner should get a minimum of 20 marks in SEE to be declared PASS in the course.
- All units of the syllabus will be covered in SEE and will be given equal weightage.
- An additional SEE will be held for those who are absent, due to valid reasons, for the main/regular SEE.
- If the learner does not get 20 marks out of 50, the learner will have to appear for the SEE ATKT.

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