College of Arts, Science & Commerce (Autonomous)

SIES

RISE WITH EDUCATION

NAAC REACCREDITED "A" GRADE

Sion (West), Mumbai – 400022.

Department of Statistics

Program: B.Sc.

Syllabus for F.Y.B.Sc.

(To be implemented from 2023 onwards)

Credit Based Semester and Grading System National Education Policy

SEMESTER I

THEORY

TITLE OF COURSE	DESCRIPTIVE STATISTICS AND PROBABILITY THEORY			
COURSE CODE	**UNIT**	**TOPICS**	**LECTURES/ WEEK**	**CREDITS**
	I	**DATA TABULATION AND MEASURES OF CENTRAL TENDENCY**	**1**	**3**
	II	**MEASURES OF DISPERSION, SKEWNESS & KURTOSIS**	**1**	
	III	**ELEMENTARY PROBABILITY THEORY & RANDOM VARIABLES**	**1**	

PRACTICAL

COURSE CODE	PRACTICALS BASED ON	LECTURES/ WEEK	CREDITS
	DESCRIPTIVE STATISTICS AND PROBABILITY THEORY	**2**	**1**

SEMESTER II

THEORY

TITLE OF COURSE	DISTRIBUTION THEORY AND ESTIMATION			
COURSE CODE	**UNIT**	**TOPICS**	**LECTURES/ WEEK**	**CREDITS**
	I	**STANDARD DISCRETE DISTRIBUTIONS**	**1**	**3**
	II	**STANDARD CONTINUOUS DISTRIBUTIONS**	**1**	
	III	**ELEMENTARY TOPICS ON ESTIMATION & TESTING OF HYPOTHESIS**	**1**	

PRACTICAL

COURSE CODE	PRACTICALS BASED ON	LECTURES/ WEEK	CREDITS
	DISTRIBUTION THEORY AND ESTIMATION	**2**	**2**

SYLLABUS FOR F.Y.B.Sc. UNDER AUTONOMY SEMESTER I

- To be well versed with data collection techniques.
- To effectively use data visualization and summarization techniques to understand data.
- To understand the concepts of probability and random variable.

Course Code	Title	Credits
	DESCRIPTIVE STATISTICS AND PROBABILITY THEORY	**3 Credits**
UNIT I: DATA TABULATION AND MEASURES OF CENTRAL TENDENCY Types of data: Qualitative and Quantitative data, Time series data and cross sectiondata, discrete and continuous data. Different types of scales: nominal, ordinal, interval, and ratio. Experimental and observational data. Concept of population and sample. Census and Sample survey. Relative merits and demerits. Statistical Organizations and their functions (CSO, NSSO). Survey findings.Primary data: Concept of a questionnaire and a schedule. Secondary data: Sources. Case studies illustrating use of Statistics in different sectors. Diagrams: Bar diagrams, Pie diagram. Univariate frequency distribution of discrete and continuous variables. Cumulative frequency distribution. Graphical representation of frequency distribution by Histogram, Frequency curve, Cumulative frequency curves, Stem and leaf diagram. Central tendency of data. Requisites of a good measure of central tendency. Positionalaverages: Median, Mode, Partition Values: Quantiles. Mathematical averages: Arithmetic mean (Simple mean, trimmed mean, weighted mean, combined mean), Geometric mean, Harmonic mean. Merits and demerits of different measures.		**15 Lectures**
UNIT II: MEASURES OF DISPERSION, SKEWNESS & KURTOSIS Concept of dispersion. Requisites of good measure of dispersion. Absolute measures of dispersion: Range, Quartile Deviation, Mean absolute deviation, Standard deviation, and corresponding relative measures of dispersion. Combined variance. Raw & Central moments and relationship between them. Concept of Skewness and Kurtosis: Absolute and Relative measures of Skewness: Karl Pearson's, Bowley's and Measure based on moments. Measure of Kurtosis basedon moments. Box &Whiskers Plot.		**15 Lectures**

UNIT III: ELEMENTARY PROBABILITY THEORY & RANDOM VARIABLES Random experiment, Sample space, Event, Operation of events, mutually exclusive and exhaustive events. Classical (Mathematical), Empirical (Statistical), definitions of Probability and their properties. Subjective probability. Theorems on Addition and Multiplication of probabilities. Independence of events, pairwise and mutual independence of three events. Conditional probability, Bayes' theorem. Concept of discrete & continuous random variables: Probability distribution and cumulative distribution function, definition, and their properties. Expectation of a random variable. Theorems on Expectation & Variance. Raw and Central moments and their relationships (up to order four). Concepts of Skewness and Kurtosis.	**15 Lectures**

SEMESTER I: PRACTICALS

1. Tabulation Classification of Data
2. Diagrammatic and Graphical Representation
3. Measures of Central tendency
4. Measures of Dispersion, Moments, Measures of Skewness and Kurtosis
5. Probability
6. Random Variable -Discrete & Continuous

SYLLABUS FOR F.Y. BSc. UNDER AUTONOMY

SEMESTER II

Objectives:

- To study the concept and properties of standard discrete and continuous distribution.
- To understand theory of estimation and testing of hypothesis

Course Code	Title	Credits
	DISTRIBUTION THEORY AND ESTIMATION	**2 Credits (45 lectures)**
	UNIT I: STANDARD DISCRETE DISTRIBUTIONS Joint (Bivariate) probability distribution of two discrete & continuous random variables. Marginal and conditional distributions. Coefficient of Correlation. Independence of two random variablesfor both discrete and continuous random variables. Discrete Uniform, Hypergeometric, Binomial and Poisson distributions: mean, variance and recurrence relation for probability, fitting of distribution. Binomial approximation to Hypergeometric distribution. Poisson approximation to Binomial distribution.	**15 Lectures**
	UNIT II: STANDARD CONTINUOUS DISTRIBUTIONS Uniform, Exponential (with location, scale parameter), Gamma distribution, Beta type 1, Beta type 2 and Normal distribution. Derivations of mean, median and variance of Uniform, Exponential distribution, Gamma distribution, Beta type 1, Beta type 2. Lack of memory property of exponential distribution. Properties of Normal distribution. Use of normal tables. Normal approximation to Binomial and Poisson distribution.	**15 Lectures**
	UNIT III: ELEMENTARY TOPICS ON ESTIMATION & TESTING OF HYPOTHESIS Parameter, statistic, estimator and estimate, sampling distribution, bias and standard error of an estimator. Central Limit theorem (statement only). Sampling distributions of sample mean and sample proportion. (For large sample only) Point and Interval estimate of mean and proportion based on single sample of large size and difference between two means and proportions based on large sample sizes. Null and alternate hypotheses, Simple and composite hypothesis. Type I and II errors, Critical region, Size of the test, Level of significance. Power of the test. Applications of Normal Distribution: Tests for specified value of population mean and population proportion. Tests for equality of two population means and population proportions.	**15 Lectures**

SEMESTER II: PRACTICALS

1. Bivariate probability distributions
2. Standard Discrete Distributions
3. Standard Continuous distributions
4. Normal Distribution and Central Limit Theorem
5. Point and Interval Estimation
6. Estimation
7. Testing of Hypothesis
8. Large Sample Test

EVALUATION PATTERN:

33 to 55% continuous internal evaluation and remaining at the end of each semester.

REFERENCES:

1. Agarwal B.L. (1978). *Basic Statistics*: New Age International Ltd.
2. David S.(1994). *Elementary Probability* : Cambridge University Press.
3. Goon A.M., Gupta M.K.& Dasgupta B. (1968). *Fundamentals of Statistics*, Volume II: The World Press Private Limited, Calcutta.
4. Gupta S.C.& Kapoor V.K.(2007).*Fundamentals of Mathematical Statistics*: Sultan Chand &Sons
5. Gupta S.C.& Kapoor V.K.(2014). *Fundamentals of Applied Statistics*: Sultan Chand & Sons
6. Hoel P.G.(1947). *Introduction to Mathematical Statistics*: Asia Publishing House
7. Hogg R.V. & Tannis E.P.(1977). *Probability and Statistical Inference*: McMillan Publishing Co. Inc.
8. Kothari C.R.(1985). *Research Methodology:* Wiley Eastern Limited.
9. Medhi, J. (2013).*Statistical Methods, An Introductory Text*. Second Edition: New Age International Ltd.
10. Pitan Jim. (1977) .*Probability*: Narosa Publishing House.
11. Spiegel M.R. (1961).*Theory and Problems of Statistics*. Schaum's Publications series: Tata McGraw-Hill