



Hindi Vidya Prachar Samiti's

Ramniranjan Jhunjhunwala College

of Arts, Science & Commerce

(Autonomous College)

Affiliated to

UNIVERSITY OF MUMBAI

Syllabus for the F.Y.B.Sc.

Program: B.Sc. STATISTICS

Program Code: RJSUSTA

(CBCS 2021-2022)

F.Y.B.Sc. Statistics Syllabus Semester I & II**DISTRIBUTION OF TOPICS AND CREDITS****F.Y.B.Sc. STATISTICS SEMESTER I**

Course	Nomenclature	Credits	Topics
RJSUSTA101	Descriptive Statistics-I	02	1.Types of Data and Data Condensation. 2. Classification and Presentation of data and Measures of central tendency. 3.Measures of Dispersion, Skewness & Kurtosis.
RJSUSTA102	Statistical Methods-I	02	1. Elementary Probability Theory. 2. Concept of Discrete random variable and properties of its probability distribution. 3. Some Standard Discrete Distributions.
RJSUSTAP101 & RJSUSTAP102	Practical based on RJSUSTA101 & RJSUSTA102	02	

F.Y.B.Sc. Statistics Syllabus Semester I & II**F.Y.B.Sc. STATISTICS SEMESTER II**

Course	Nomenclature	Credits	Topics
RJSUSTA201	Descriptive Statistics-II	02	1. Correlation and Regression 2. Time Series 3. Index Numbers
RJSUSTA202	Statistical Methods-II	02	1. Continuous Random Variable 2. Some Standard Continuous Distributions. 3. Estimation and Testing of hypothesis
RJSUSTAP201 &RJSUSTAP202	Practical based on RJSUSTA201 & RJSUSTA202	02	

F.Y.B.Sc. Statistics Syllabus Semester I & II

SEMESTER I (THEORY)		L	Cr
Paper-I: Descriptive Statistics-I	Paper Code: RJSUSTA101	45	2
UNIT I		15	
TYPES OF DATA AND DATA CONDENSATION			
1	Concept of population, sample. Finite, Infinite population, Notion of SRS, SRSWOR and SRSWR.		
2	Collection of Primary data: concept of a questionnaire and a schedule, Secondary data.		
3	Types of data: Qualitative and quantitative data; Time series data and geographical data, discrete and continuous data.		
4	Different types of scales: nominal, ordinal, interval and ratio. Tabulation of data.		
5	Dichotomous classification- for two and three attributes, Verification for consistency.		
6	Association of attributes: Yule's coefficient of association (Q), Yule's coefficient of Colligation (Y).		
UNIT II		15	
CLASSIFICATION AND PRESENTATION OF DATA AND MEASURES OF CENTRAL TENDENCY			
1	Univariate frequency distribution. Discrete and continuous variables. Cumulative frequency distribution.		
2	Bivariate frequency distribution, marginal and conditional frequency distribution.		
3	Diagrammatic representation: Bar diagrams and Pie chart.		
4	Graphical representation of frequency distribution by Histogram, frequency polygon, Cumulative frequency curve. Stem and leaf diagram.		
5	Concept of central tendency of data. Requirements of good measure.		

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6	Locational averages: Median, Mode, and Partition Values: Quartiles, Deciles, and Percentiles.		
7	Mathematical averages: Arithmetic mean (Simple, weighted mean, combined mean), Geometric mean, Harmonic mean and their relationship.		
8	Empirical relation between mean, median and mode.		
9	Merits and demerits of using different measures & their applicability.		
10	Box Plot.		
UNIT III		15	
MEASURES OF DISPERSION, SKEWNESS & KURTOSIS			
1	Concept of dispersion. Requirements of good measure.		
2	Absolute and Relative measures of dispersion: Range, Quartile Deviation, Mean absolute deviation, Standard deviation.		
3	Variance and Combined variance, raw moments and central moments and relations between them. Their properties.		
4	Concept of Skewness and Kurtosis: Measures of Skewness: Karl Pearson's, and Bowley's and Coefficient of Skewness based on moments. Measure of Kurtosis.		

F.Y.BSc	Semester I Theory
RJSUSTA101	Course Outcomes 1.1 :
Paper I	Students will acquire knowledge of
Descriptive	1. statistics and its scope and importance in various areas such as Medical,
Statistics-I	Engineering, Agricultural and Social Sciences etc.
	2. various types of data, their organisation and evaluation of summary measures such as measures of central tendency and dispersion etc.
	3. other types of data reflecting quality characteristics including concepts of independence and association between two attributes.
	Learning Outcomes
	After completion of this course students will be able to
	➤ display data graphically and interpret graphs: stem and leaf plots, histograms, and box plots.
	➤ recognize, describe, and calculate various measures of location of data.
	➤ recognize, describe, and calculate various measures of location of data.

SEMESTER I (THEORY)		L	Cr
Paper-II: Statistical methods-I	Paper Code: RJSUSTA102	45	2
<i>UNIT I</i>		15	
<i>ELEMENTARY PROBABILITY THEORY</i>			
1	Trial, random experiment, sample point and sample space.		
2	Definition of an event. Operation of events, mutually exclusive and exhaustive events, equally likely and impossible events.		
3	Classical (Mathematical) and Empirical definitions of Probability and their properties		
4	Theorems on Addition and Multiplication of probabilities.		
5	Independence of events, pairwise and mutual independence for three events, Conditional probability, Bayes theorem and its applications.		
<i>UNIT II</i>		15	
<i>CONCEPT OF DISCRETE RANDOM VARIABLE AND PROPERTIES OF ITS PROBABILITY DISTRIBUTION</i>			
1	Concept of Random variable. Definition and properties of probability distribution and cumulative distribution function		
2	Function of discrete random variable.		
3	Raw and Central moments (definition only) and their relationship. (upto order four).		
4	Concepts of Skewness and Kurtosis and their uses.		
5	Expectation of a random variable. Theorems on Expectation & Variance.		
6	Joint probability mass function of two discrete random variables. Marginal and Conditional distributions.		

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7	Covariance and Coefficient of Correlation. Independence of two random variables.		
UNIT III		15	
SOME STANDARD DISCRETE DISTRIBUTIONS			
1	Discrete Uniform, Binomial and Poisson distributions and derivation of their mean and variance.		
2	Recurrence relation for probabilities of Binomial and Poisson distributions. Poisson approximation to Binomial distribution		
3	Concept of hypergeometric distribution.		

F.Y.BSc	Semester I Theory
RJSUSTA102	Course Outcomes1.2 :
Paper II	Students will acquire
Statistical methods-I	<ol style="list-style-type: none"> 1. the ability to distinguish between random and non-random experiments. 2. knowledge to conceptualize the probabilities of events including frequentist and axiomatic approach. Simultaneously, they will learn the notion of conditional probability including the concept of Bayes' Theorem. 3. knowledge related to the concept of discrete random variable and its probability distribution including expectation and moments. 4. knowledge of important discrete distributions such as Binomial, Poisson, Geometric and Hypergeometric and their interrelations if any.
	Learning outcomes:
	After completion of this course students will be able to
	<ul style="list-style-type: none"> ➤ understand different types of probability. ➤ identify mutually exclusive and independent events.

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	➤ calculate probabilities using the Addition & Multiplication Rules.
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SEMESTER II (THEORY)		L	Cr
Paper-I: Descriptive Statistics-II	Paper Code: RJSUSTA201	45	2
UNIT I		15	
CORRELATION AND REGRESSION ANALYSIS			
1	Scatter Diagram, Product moment correlation coefficient and its properties. Spearman's Rank correlation. (With and without ties).		
2	Concept of linear regression. Principle of least squares. Fitting a straight line by method of least squares. Concept and use of coefficient of determination (R^2).		
3	Relation between regression coefficients and correlation coefficient.		
4	Fitting of curves: quadratic curves, power curves, exponential and logarithmic curves		
UNIT II		15	
TIME SERIES			
1	Definition of Time series. Its components. Models of Time Series. Estimation of trend by: (i) Freehand curve method (ii) Method of Semi averages (iii) Method of Moving Averages (iv) Method of Least Squares. (v) Exponential Smoothing method		
2	Estimation of seasonal component by: (i) Method of simple averages (ii) Ratio to moving average method (iii) Ratio to trend method.		
UNIT III		15	
INDEX NUMBERS			
1	Index numbers as a comparative tool. Stages in the construction of Price Index Numbers		

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2	Measures of Simple and Composite Index Numbers. Laspeyre's, Paasche's, Marshal-Edgeworth's, Dorbisch & Bowley's and Fisher's Index Numbers formula.		
3	Quantity Index Numbers and Value Index Numbers Time reversal test, Factor reversal test, Circular test.		
4	Fixed base Index Numbers, Chain base Index Numbers. Base shifting, splicing and deflating.		
5	Cost of Living Index Number, Concept of Real Income based on Wholesale Price Index Number.		

F.Y.B.Sc.	Theory Semester II
RJSUSTA201 Paper-I Descriptive Statistics-II	<p>Course Outcomes 2.1:</p> <p>Students will acquire knowledge of</p> <ol style="list-style-type: none"> 1. correlation and regression techniques, the two very powerful tools in statistics. 2. quadratic curves, power curves, exponential and logarithmic curves 3. time series data and different components of Time Series. 4. Index Numbers and different types of Index Numbers. <p>Learning outcomes:</p> <p>After completion of this course students will</p> <ul style="list-style-type: none"> ➤ know the techniques of data analysis. ➤ understand the need for numerical summary measures for data analysis.

SEMESTER II (THEORY)		L	Cr
Paper-II: Statistical Methods-II	Paper Code: RJSUSTA202	45	2
<i>UNIT I</i>		15	
<i>CONTINUOUS RANDOM VARIABLE</i>			
1	Concept of Continuous random variable, P.D.F and C.D.F and their properties and their graphical representation.		
2	Expectation of a random variable and its properties. Measures of location, dispersion, skewness and kurtosis. Raw and central moments (simple illustrations)		
<i>UNIT II</i>		15	
<i>SOME STANDARD CONTINUOUS DISTRIBUTIONS</i>			
1	Uniform distribution and derivation of its mean, median, mode and variance.		
2	Exponential distribution and derivation of its mean, median, mode and variance.		
3	Normal distribution and its properties. Normal approximation to Binomial and Poisson distribution (statement only). Use of a Normal table.		
<i>UNIT III</i>		15	
<i>ESTIMATION AND TESTING OF HYPOTHESIS</i>			
1	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) and its uses. 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.		

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2	Concept of hypothesis, Null and Alternate hypothesis, Types of errors, Critical region, Level of significance.		
3	Large sample tests (using central limit theorem, if necessary), For testing specified value of population mean, For testing specified value in difference of two means, For testing specified value of population proportion, For testing specified value of difference of population proportions (Development of critical region is not expected).		

F.Y.B.Sc.	Theory Semester II:
RJSUSTA202	Course Outcomes 2.2:
Paper II	Students will acquire knowledge of
Statistical Methods-II	<ol style="list-style-type: none"> 1. various basic concepts on sampling distributions and large sample tests based on normal distribution. 2. small sample tests. 3. two dimensional discrete and continuous random variables, their associated distributions, characteristics, marginal and conditional distributions.
	Learning outcomes:
	After this course students will
	<ul style="list-style-type: none"> ➤ recognize and understand continuous probability density functions in general. ➤ recognize various distributions and apply them appropriately. ➤ apply and interpret the central limit theorem. ➤ be able to calculate and interpret confidence intervals for estimating a population mean and a population proportion. ➤ know the importance of inferential aspects such as point estimation, test of hypotheses and associated concepts.

F.Y.B.Sc. Statistics Syllabus Semester I & II

Semester I (PRACTICALS)		L	Cr
Practical-I: Descriptive Statistics-I		Paper Code: RJSUSTAP101	1
1	Tabulation		
2	Attributes		
3	Classification of Data		
4	Diagrammatic Representation - I		
5	Diagrammatic Representation – II		
6	Measure of central tendency		
7	Measure of dispersion		
Practical-II: Statistical Methods-I		Paper Code: RJSUSTAP102	1
1	Probability		
2	Discrete Random Variables		
3	Bivariate Probability Distributions		
4	Binomial distribution, Poisson distribution and Hypergeometric distribution		

F.Y.B.Sc. Statistics Syllabus Semester I & II

F.Y.B.Sc.	Semester I
RJSUSTAP101 Practical - I Descriptive Statistics-I	<p>Course Outcomes:</p> <p>Students will acquire</p> <ol style="list-style-type: none">1. practical knowledge of Statistics and its scope.2. practical knowledge of organization and data interpretation.3. practical knowledge of data reflecting quality of independence and associations between two attributes.4. understanding the measure of central tendency and measure of dispersion. <p>Learning outcomes:</p> <p>After this course students will</p> <ul style="list-style-type: none">➤ be able to display data graphically and interpretation of graphs: stem plots, histograms, and box plots.➤ be able to recognize, describe, and calculate the measures of location of data: quartiles and percentiles.➤ be able to recognize, describe, and calculate the measures of the spread of data: variance, standard deviation, and range.

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F.Y.B.Sc.	Semester I
RJSUSTAP102 Practical II Statistical Methods-I	<p>Course Outcomes:</p> <p>Students will acquire</p> <ol style="list-style-type: none">1. practical knowledge of random and non-random experiments, practical knowledge to conceptualize the probabilities of events including frequentist and axiomatic approach. Simultaneously, they will learn the notion of conditional probability including the concept of Bayes' Theorem.2. practical knowledge related to concept of discrete random variable and its probability distribution including expectation and moments.3. practical knowledge of important discrete distributions such as Binomial, Poisson and Hypergeometric and their interrelations if any. <p>Learning outcomes:</p> <p>After this course students will</p> <ul style="list-style-type: none">➤ practical application of Discrete Probability distribution.➤ application of Binomial, Poisson and Hypergeometric Distribution.➤ application of different Discrete Probability distribution.➤ real life problem solving of different discrete probability distributions.

Semester II (PRACTICALS)		L	Cr
Practical-I: Descriptive Statistics-II	Paper Code: RJSUSTAP201		1
1	Correlation		
2	Regression Analysis		
3	Curve Fitting		
4	Time Series		
5	Index Number – I		
6	Index Number – II		
Practical II Statistical Methods-II	Paper Code: RJSUSTAP202		1
1	Continuous Random Variables		
2	Uniform, Exponential and Normal Distributions		
3	Applications of central limit theorem and normal approximation		
4	Testing of Hypothesis		
5	Large Sample Tests		

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F.Y.B.Sc.	Practicals Semester II
RJSUSTAP201 Practical II Descriptive Statistics-II	<p>Course Outcomes:</p> <p>Students will acquire</p> <ol style="list-style-type: none">1. practical application of correlation and regression techniques, the two very powerful tools in statistics.2. how to use time series data and different components of Time Series in the practical world. <p>Learning outcomes:</p> <p>After this course students will</p> <ul style="list-style-type: none">➤ be able to understand application of Regression Analysis, Correlation Analysis, Time Series & Index Number.➤ be able to understand how real-Life Problem Solving of Regression Analysis, Correlation Analysis, Time Series & Index Number.

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F.Y.B.Sc.	Practicals Semester II
RJSUSTAP202 Practical II Statistical Methods-II	<p>Course Outcomes:</p> <p>Students will acquire</p> <ol style="list-style-type: none">1. practical knowledge of random and non-random experiments,2. practical knowledge to conceptualise the probabilities of events including frequentist and axiomatic approach.3. practical knowledge related to the concept of discrete random variable and its probability distribution including expectation and moments.4. practical knowledge of important Continuous distributions such as Normal, Exponential and Uniform Distribution and their interrelations if any.5. knowledge of Testing of Hypothesis. <p>Learning outcomes:</p> <p>After this course students will</p> <ul style="list-style-type: none">➤ be able to understand the practical application of Continuous Probability distribution.➤ be able to understand the practical application of Normal, Exponential and Uniform Distribution.➤ be able to understand the practical real-life problem solving of different Continuous Probability distributions.➤ be able to understand the applications of Testing of Hypothesis.

References

1. Welling, Khandeparker : Descriptive Statistics , Manan Prakashan
2. Welling, Khandeparker : Statistical Methods , Manan Prakashan
3. S.C.Gupta and V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan chand and Sons.
4. Medhi J. : Statistical Methods, An Introductory Text, Second Edition, New Age International Ltd.
5. Agarwal B.L. : Basic Statistics, New Age International Ltd.
6. Spiegel M.R. : Theory and Problems of Statistics, Schaum' s Publications series. Tata McGraw-Hill.
7. Kothari C.R. : Research Methodology, Wiley Eastern Limited.
8. David S. : Elementary Probability, Cambridge University Press.
9. Hoel P.G. : Introduction to Mathematical Statistics, Asia Publishing House.
10. Hogg R.V. and Tannis E.P. : Probability and Statistical Inference. McMillan Publishing Co. Inc.
11. Pitan Jim : Probability, Narosa Publishing House.
12. Goon A.M., Gupta M.K., Dasgupta B. : Fundamentals of Statistics, Volume II : The World Press Private Limited, Calcutta.
13. Milan Gholba, Sudha Pathak, Madhavi Jardosh : Descriptive Statistics , Vipul Prakashan.
14. Milan Gholba, Sudha Pathak, Madhavi Jardosh : Statistical Methods , Vipul Prakashan.

Scheme of Examinations

1. Two Internals of 20 marks each. Duration 30 min for each.
2. One External (Semester End Examination) of 60 marks. Duration: 2 hours.
3. One Practical at the end of Semester consisting of practical I-50 marks and Practical II-50 marks but passing combined out of 100.
4. Minimum marks for passing Semester End Theory and Practical Exam is 40 %.
5. Students must appear for at least one of the two Internal Tests to be eligible for the Semester End Examination.
6. For any KT examinations, there shall be ODD-ODD/EVEN-EVEN pattern followed.
7. A candidate will be allowed to appear for the practical examinations if he/she submits a certified journal of F.Y.B.Sc. Statistics or a certificate from the Head of the department / Institute to the effect that the candidate has completed the practical course of F.Y.B.Sc. Statistics as per the minimum requirements.
8. In case of loss of journal, a candidate must produce a certificate from the Head of the department /Institute that the practicals for the academic year were completed by the student. However, such a candidate will be allowed to appear for the practical examination, but the marks allotted for the journal will not be granted.
9. HOD's decision, in consultation with the principal, shall remain final and abiding to all.

Evaluation and Assessment**Evaluation (Theory): Total marks per course - 100.****CIA- 40 marks****CIA 1: Written test -20 marks****CIA 2: Written Test / Assignment -20 marks****Semester End Examination – 60 marks****Question paper covering all units****Evaluation of Practicals 100 marks (50 marks for each practical RJSUSTA101 & RJSUSTAP102, AND RJSUSTAP201 & RJSUSTAP202)****Course Semester End Examination in Semester I and II Paper I and II
(RJSUSTA101 & RJSUSTA102, RJSUSTA201 & RJSUSTA202)**

Question	KNOWLEDGE	UNDERSTANDING	APPLICATION and ANALYSES	TOTAL MARKS- Per unit
Unit 1	10	05	05	20
Unit 2	10	05	05	20
Unit 3	10	05	05	20
-TOTAL- Per objective	30	15	15	60
% WEIGHTAGE	50	25	25	100%

Evaluation of Practicals 100 marks (50 marks for each practical RJSUSTAP101 & RJSUSTAP102 AND RJSUSTAP201 & RJSUSTAP202)

Continuous Evaluation of components which require adequate duration for completion of the task, observation and interpretation: 25%

Course end Practical Evaluation of skills of students in terms of skill, analysis, interpretation and conclusion.

F.Y.B.Sc. Statistics Syllabus Semester I & II

Mapping of the course to employability/ Entrepreneurship/skill development

Class	Course Name	Course Code	Topic focusing on Employability/ Entrepreneurship/skill development	Employability/Entrepreneurship/Skill development	Specific activity
F Y B Sc Statistics	Descriptive Statistics - I & II	RJSUSTA101 RJSUSTA201	Unit 2 . Classification and Presentation of data and Measures of central tendency Unit 3. Measures of Dispersion, Skewness & Kurtosis Unit 1. Correlation and regression analysis Unit 2. Time series Unit 3. Index Numbers	1. Data collection and presentation skills. 2. Data Analyzing skills 3. Employability in the field of Data Science. 4. Employability in the field of Research.	
F Y B Sc Statistics	Statistical Methods - I & II	RJSUSTA102 RJSUSTA202	Unit 1. Elementary Probability Theory Unit 2. Concept of Discrete random variable and properties of its probability distribution Unit 3. Some Standard Discrete Distributions Unit 1. Concept of Continuous random variable Unit 2. Some Standard Continuous Distribution	1. Employability in the field of sports, weather reports etc. 2. Problem solving abilities 3. Employability in the field of Research.	

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			Unit 3. Estimation and Testing of hypothesis		
F Y B Sc Statistics	Practicals	RJSUSTAP101 RJSUSTAP102 RJSUSTAP201 RJSUSTAP202	Identification of data, calculation of central tendency, dispersion, skewness& kurtosis and its interpretation. Problem solving of Time series data, Index Number, Regression & Correlation Analysis	<ol style="list-style-type: none"> 1. Analytical skills 2. Interpretation skills 3. Data Visualization skills 4. Problem solving skills 	