

Deccan Education Society's

Kirti M. Doongursee College of Arts, Science and Commerce (AUTONOMOUS)



Affiliated to

UNIVERSITY OF MUMBAI

Syllabus for
Program: Bachelor of Science
Course: F.Y.B.SC.
Subject: Statistics

Choice Based Credit System (CBCS)
with effect from
Academic Year 2022-2023

Course Code	Course Title	Credits	Lectures /Week
KUSST22101	Descriptive Statistics - I	2	3

About the Course:

Course Objectives:

The learner would be able to understand:

- Categorization of different types of data.
- Different types of data measurement scales.
- To measure the association between two attributes.
- Construction of univariate and bivariate frequency distribution for discrete and continuous variables. Cumulative frequency distribution.
- Graphical representation of data for above frequency distributions.
- Analyze data using measures of central tendency.
- Analyze data using measures of dispersion.
- Relate raw moments and central moments.
- Concept of skewness and kurtosis.
- Identify outliers.

Unit	Topics	No of Lectures
I	<p>Types of Data and Data Condensation:</p> <ul style="list-style-type: none"> a) Concept of population and sample. Finite, Infinite population, Notion of SRS, SRSWOR and SRSWR. b) Types of Characteristics, Different types of scales: nominal, ordinal, interval and ratio. c) Collection of Primary data: concept of a questionnaire and a schedule, Secondary data. d) Types of data: Qualitative and quantitative data: Time series data and cross section data, discrete and continuous data. e) Tabulation. f) Dichotomous classification- for two and three attributes, Verification for consistency. g) Association of attributes: Yule's coefficient of association Q. Yule's coefficient of Colligation. 	15
II	<p>Classification of Data and Measures of central tendency</p> <p>i) Classification of Data</p> <ul style="list-style-type: none"> a) Univariate frequency distribution of discrete and continuous variables. Cumulative frequency distribution. b) 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"> a) Concept of central tendency of data. Requirements of good measure. b) Locational averages: Median, Mode, and Partition Values: Quartiles, Deciles, Percentiles. c) Mathematical averages: Arithmetic mean (Simple, weighted mean, combined mean), Geometric mean, Harmonic mean. d) Empirical relation between mean, median and mode Merits and demerits of using different measures & their applicability. 	15
III	<p>Measures of Dispersion, Skewness and Kurtosis</p> <ul style="list-style-type: none"> a) Concept of dispersion. Requirements of good measure. b) Absolute and Relative measures of dispersion: Range, Quartile Deviation, Mean absolute deviation, Standard deviation. 	15

	<p>c) Variance and Combined variance, raw moments and central moments and relations between them, their properties.</p> <p>d) Concept of Skewness and Kurtosis: Measures of Skewness: Karl Pearson's, Bowley's and Coefficient of skewness based on moments, Measure of Kurtosis.</p> <p>e) Box Plot</p>	
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Textbooks:

1. Gholba-Phatak-Jardosh: Descriptive Statistics, Vipul Prakashan.
2. Welling-Khandeparkar: Descriptive Statistics, Manan Prakashan.
3. Dr. Kore B G. and Dr. Dixit P. G.: Descriptive Statistics I, Nirali Prakashan, Pune.

Additional References:

1. Gupta V. K. & Kapoor S. C.: Fundamentals of Mathematical Statistics, Sultan & Chand
2. Hogg R. V. and Crag R. G.: Introduction to Mathematical Statistics
3. Gupta S. P. (2002): Statistical Methods, Sultan Chand and Sons, New Delhi.

Course Code	Course Title	Credits	Lectures /Week
KUSST22102	Statistical Methods - I	2	3
<p>About the Course:</p>			
<p>Course Objectives: The learner would be able to understand:</p> <ul style="list-style-type: none"> • Basic rules of probability. Compute probabilities of events. • Concept of random variable and its distribution and properties. • Apply standard discrete probability distributions based on real life. 			
Unit	Topics	No of Lectures	
I	<p>Elementary Probability Theory</p> <p>a) Trial, random experiment, sample point and sample space.</p> <p>b) Definition of an event. Operation of events, mutually exclusive and exhaustive events.</p> <p>c) Classical (Mathematical) and Empirical definitions of Probability and their properties.</p> <p>d) Theorems on Addition and Multiplication of probabilities.</p>	15	

	<p>e) Independence of events, pairwise and mutual independence for three event Conditional probability.</p> <p>f) Bayes theorem and its applications.</p>	
II	<p>Concept of Discrete Random Variable and properties of its probability distribution</p> <p>a) Random variable. Definition and properties of probability distribution and cumulative distribution function of discrete random variable.</p> <p>b) Raw and Central moments (definition only) and their relationship (up to order four).</p> <p>c) Concepts of Skewness and Kurtosis and their uses.</p> <p>d) Expectation of a random variable. Theorems on Expectation & Variance.</p> <p>e) Joint probability mass function of two discrete random variables.</p> <p>f) Marginal and conditional distributions. Theorems on Expectation & Variance, Covariance and Coefficient of Correlation. Independence of two random variables.</p>	15
III	<p>Some Standard Discrete Distributions</p> <p>a) Discrete Uniform, Binomial and Poisson distributions and derivation of their mean and variance.</p> <p>b) Recurrence relation for probabilities of Binomial and Poisson distributions.</p> <p>c) Poisson approximation to Binomial distribution. Hyper geometric distribution, Binomial approximation to hyper geometric distribution.</p>	15

Textbooks:

4. Gholba-Phatak: Statistical Methods, Vipul Prakashan.
5. Welling-Khandeparkar: Statistical Methods, Manan Prakashan.
6. Dr. Kore B. G. and Dr. Dixit P. G.: "Elementary Probability Theory", Nirali Prakashan, Pune.

Additional References:

4. Gupta V. K. & Kapoor S. C.: Fundamentals of Mathematical Statistics, Sultan & Chand.
5. Mood A. M., Graybill F. A. and Boes D. C.: Introduction to the Theory of Statistics, McGraw Hill.
6. Hogg, R. V., Tanis, E.A. and Rao J.M.: Probability and Statistical Inference, Seventh Edition, Pearson Education, New Delhi.

Course Code	Course Title	Credits	Lectures/ Week
KUSSTP22101	Practical 1	1	3
<p>Course Objectives: At the end of this course students are expected to be able:</p> <ul style="list-style-type: none"> • To represent statistical data diagrammatically and graphically. • To compute various measures of central tendency, dispersion, moments, skewness and kurtosis. • To understand Association and Independence of Attributes. 			
1	Tabulation		
2	Attributes		
3	Classification of Data		
4	Diagrammatic representation		
5	Measures of central tendency		
6	Measures of dispersion		
7	Practical using Excel and R <ul style="list-style-type: none"> i) Classification of Data and Diagrammatic representation ii) Measures of central tendency iii) Measures of dispersion 		

Course Code	Course Title	Credits	Lectures/ Week
KUSSTP22101	Practical 2	1	3
<p>Course Objectives: At the end of this course students are expected to be able:</p> <ul style="list-style-type: none"> • To apply the laws of probability. • To find various measures of discrete random variable and probabilities using its probability distribution. • To know applications of some standard discrete probability distributions. 			
1	Probability		
2	Discrete Random Variables		
3	Bivariate Probability Distributions		
4	Binomial distribution		
5	Poisson distribution		
6	Hyper geometric distribution		
7	Practical's Using R: Binomial, Poisson, Hyper geometric distribution		

Course Code	Course Title	Credits	Lectures /Week
KUSST22201	Descriptive Statistics - II	2	3

About the Course:

Course Code	Unit	Topics
		Semester - 2
KUSST22201	I	Correlation and Regression Analysis
	II	Time Series
	III	Index Numbers

Course Objectives:

The learner would be able to understand:

- Compute the correlation between two variables and its interpretation.
- Construction of simple linear regression model. Interpretation of regression coefficient and coefficient of determination.
- Fitting of regression line and different types of curves using the method of least squares.
- Identifying various components of time series.
- Different methods for identifying and eliminating these components.
- Concept and construction of index numbers.

Unit	Topics	No of Lectures
I	Correlation and regression analysis a) Scatter Diagram, Product moment correlation coefficient and its properties. Spearman's Rank correlation. (With and without ties) b) Concept of linear regression. Principle of least squares. Fitting a straight line by method of least squares. c) Relation between regression coefficients and correlation coefficient. d) Fitting of curves reducible to linear form by	15

	<p>transformation. Concept and use of coefficient of determination (R^2).</p> <p>e) Fitting a quadratic curve by method of least squares.</p>	
II	<p>Time Series</p> <p>a) Definition of time series .Its component. Models of time series.</p> <p>b) Estimation of trend by:</p> <p>i) Freehand curve method</p> <p>ii) method of semi average</p> <p>iii) Method of Moving average</p> <p>iv) Method of least squares (linear trend only)</p> <p>c) Estimation of seasonal component by i) method of simple average ii) Ratio to moving average iii) Ratio to trend method</p>	15
III	<p>Index Numbers</p> <p>a) Index numbers as comparative tool. Stages in the construction of Price Index Numbers.</p> <p>b) Measures of Simple and Composite Index Numbers. Laspeyre's, Paasche's, Marshal-Edgeworth's, Dorbey's & Bowley's and Fisher's Index Numbers formula.</p> <p>c) Quantity Index Numbers and Value Index Numbers Time reversal test, Factor reversal test, Circular test.</p> <p>d) Fixed base Index Numbers, Chain base Index Numbers. Base shifting, splicing and deflating.</p> <p>e) Cost of Living Index Number. Concept of Real Income based on Wholesale Price Index Number.</p>	15

Textbooks:

7. Gholba-Phatak-Jardosh: Descriptive Statistics, Vipul Prakashan.
8. Welling-Khandeparkar: Descriptive Statistics, Manan Prakashan.
9. Dr. Kore B G. and Dr. Dixit P. G.: Descriptive Statistics I, Nirali Prakashan, Pune.

Additional References:

7. Gupta V. K. & Kapoor S. C.: Fundamentals of Mathematical Statistics, Sultan & Chand.
8. Gupta V. K. & Kapoor S. C.: Fundamentals of Applied Statistics, Sultan & Chand.
9. Kapur, J. N and Gupta, H. C.: Fundamentals of Mathematical Statistics, Sultan Chand and Sons, New Delhi.

Course Code	Course Title		Credits	Lectures /Week
KUSST22202	Statistical Methods - II		2	3
About the Course:				
Course Code	Unit	Topics		
		Semester - 2		
KUSST22202	I	Continuous Random Variable		
	II	Some Standard Continuous Distributions		
	III	Elementary topics on Estimation and Testing of Hypothesis		
Course Objectives:				
The learner would be able to understand:				
<ul style="list-style-type: none"> • Concept of continuous random variable and its probability density function and cumulative distribution function. • Different types of standard continuous probability distributions and their properties. • Difference between point estimation and interval estimation. • Terminologies of testing of hypothesis and solving examples based on large sample test. 				
Unit	Topics			No of Lectures
I	Continuous random variable a) Concept of Continuous random variable and properties of its probability distribution. b) Probability density function and cumulative distribution function. Their graphical representation. c) Expectation of a random variable and its properties.			15

	<ul style="list-style-type: none"> d) Measures of location, dispersion, skewness and kurtosis. e) Raw and central moments (simple illustrations). 	
II	<p>Some Standard Continuous Distributions</p> <ul style="list-style-type: none"> a) Uniform, Exponential (location scale parameter), memory less property of exponential distribution and Normal distribution. b) Derivations of mean, median and variance for Uniform and Exponential distributions. Properties of Normal distribution (without proof). Normal approximation to Binomial and Poisson distribution (statement only). Properties of Normal curve. Use of normal tables. 	15
III	<p>Elementary topics on Estimation and Testing of hypothesis:</p> <ul style="list-style-type: none"> a) Sample from a distribution : b) Concept of a statistic, estimate and its sampling distribution. Parameter and its estimator. c) Concept of bias and standard error of an estimator. d) Central Limit theorem (statement only). e) Sampling distribution of sample means and sample proportion. (For large sample only). f) Standard errors of sample mean and sample proportion. g) Point and Interval estimate of single mean, single proportion from sample of large size. h) Statistical tests : <ul style="list-style-type: none"> i) Concept of hypothesis ii) Null and alternate hypothesis, iii) Types of errors, Critical region, Level of significance. iv) Large sample tests (using central limit theorem, if necessary) <ul style="list-style-type: none"> A. For testing specified value of population mean B. For testing specified value in difference of two means C. For testing specified value of population proportion D. For testing specified value of difference of population proportion (Development of critical region is not expected.) i) Use of central limit theorem 	15
<p>Textbooks:</p> <ul style="list-style-type: none"> 10. Gholba-Phatak: Statistical Methods, Vipul Prakashan. 11. Welling-Khandeparkar: Statistical Methods, Manan Prakashan. 12. Dr. Kore B. G. and Dr. Dixit P. G.: “Elementary Probability Theory”, Nirali Prakashan, Pune. 		

Additional References:

- Rohatgi V. K. and Saleh A. K. Md. E. (2002): An introduction to probability and statistics, John Wiley and Sons.
- Mood A. M., Graybill F. A. and Boes D. C.: Introduction to the Theory of Statistics, McGraw Hill.
- Hogg, R. V., Tanis, E.A. and Rao J.M.: Probability and Statistical Inference, Seventh Edition, Pearson Education, New Delhi.

Course Code	Course Title	Credits	Lectures/ Week
KUSSTP22201	Practical 1	1	3
<p>Course Objectives: At the end of this course students are expected to be able:</p> <ul style="list-style-type: none"> • To compute correlation coefficient, interpret its value. • To compute regression coefficient, interpret its value. • To compute the index numbers. 			
Section A			
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		

Course Code	Course Title	Credits	Lectures/Week
KUSSTP22201	Practical 2	1	3
<p>Course Objectives: At the end of this course students are expected to be able:</p> <ul style="list-style-type: none"> • To find various measures of continuous random variable and probabilities using its probability distribution. • To compute probabilities of standard continuous probability distributions. • To know some standard continuous probability distributions with real life situations. 			
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		
6	2,3,4,5, Practicals Using R		
7	Continuous Random Variables		

Evaluation Scheme for First Year (UG) under AUTONOMY

I. Internal Evaluation for Theory Courses – 40 Marks

- (i) **Continuous Internal Assessment 1 -Tutorial** – 20 Marks
- (ii) **Continuous Internal Assessment 2 – Class Test**- 20 Marks
(Class Test with Fill in the Blanks, True or False & Answer the following)

II. External Examination for Theory Courses – 60 Marks

Duration: 2 Hours

Theory question paper pattern:

All questions are compulsory.

Question	Based on	Options	Marks
Q.1	MCQs on Unit I, II & III	All are compulsory	12
Q.2	Unit I	Any 2 out of 3	12
Q.3	Unit II	Any 2 out of 3	12
Q.4	Unit III	Any 2 out of 3	12
Q.5	Unit I, II, III	Any 3 out of 6	12

- All questions shall be compulsory with internal choice within the questions.
- Each Question may be sub-divided into sub questions as a, b, c. & the allocation of Marks depends on the weightage of the topic.

III. Practical Examination

- Each core subject carries 50 Marks:
 - (i) 25 marks written practical (ii) 5 marks Viva (iii) 5 marks Journal (iv) 15 marks Internal(Field visit or Project work on secondary data)

Each core subject carries 50 Marks (30 marks External + 20 marks Internal)

Sr. No.	Undergraduate Practical Internal Evaluation:	Marks
1	Short Experiment/Field Trip/Excursion/Industrial Visit Report	15

2	Journal	5
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Sr. No.	Undergraduate Practical External Evaluation:	Marks
1	Experiment/s	25
2	Viva	5

- Duration: 1 Hours for each practical course.
- Minimum 80% practical from each core subjects are required to be completed.
- Certified Journal is compulsory for appearing at the time of Practical Examination.

