

Progressive Education Society's
Modern College of Arts, Science and Commerce,
Shivajinagar, Pune - 5
Third Year of B.Com. (NEP-2024) Semester V

Course Code: 24CoBstU5103

Course Name: Continuous distributions and testing of hypotheses.

Teaching Scheme: 4 Hours/Week

Credit: 4

Examination Scheme: CIA: 40 Marks

End-Sem: 60 Marks

Prerequisites Courses:

- Knowledge of probability models.

Course Objectives: To study

- various parametric and non-parametric tests
- Applications of parametric tests on various standard probability distributions
- Carryout appropriate non-parametric test for real data sets.

Course Outcomes: On completion of the course, student will be able to:

1. Learn the nature of uniform and exponential distributions and their applications.
2. Study the nature of normal probability distribution and probability curve.
3. Study the properties of normal distribution.
4. Study its application in real life situations.
5. Learn the nature probability distribution and probability curve of chi-square distribution, t-distribution and F-distribution.
6. Understand the concept of null-hypotheses and alternative hypotheses, critical region, p-value.
7. Study the application of one sided and two sided test, test of hypotheses for parametric test.
8. Study the application of one sided and two sided test, test of hypotheses for non-parametric test.

Course Content:

	Title and content	Lectures
1	Standard Continuous Probability Distributions	20
	1.1 Uniform Distribution: Statement of p.d.f, mean, variance, nature of probability curve. 1.2 Exponential Distribution: Statement of p.d.f, mean, variance, nature of probability curve, lack of memory property (without proof). 1.3 Normal Distribution: Definition, p.d.f. curve, properties of normal distribution, state mean and variance, standard normal variate, problems to evaluate probabilities(using statistical table and excel), additive property for two variables (statement only). Fitting of normal distribution. Examples and problems. 1.4 Chi-square Distribution: Definition, p.d.f. curve, properties of chi-square distribution, state mean and variance. 1.5 t-Distribution: Definition, p.d.f. curve, properties of chi-square distribution, state mean and variance.	

	1.6 f-Distribution: Definition, p.d.f. curve, properties of chi-square distribution, state mean and variance.	
2	Test of hypotheses	24
	2.1 Definitions of : Hypotheses, Null hypotheses, alternative hypotheses, critical region, types of errors, level of significance, P-value. 2.2 Test for Population Mean(Approximate and Exact tests): Describe test procedure for testing i. $H_0: \mu = \mu_0$ against $H_1: \mu \neq \mu_0$ and ii. $H_0: \mu_1 = \mu_2$ against $H_1: \mu_1 \neq \mu_2$. 2.3 Describe the test procedure for paired t-test. 2.4 Test for population proportion : Describe test procedures for testing i. $H_0: P = P_0$ against $H_1: P \neq P_0$ and ii. $H_0: P_1 = P_2$ against $H_1: P_1 \neq P_2$. 2.5 Describe Chi-square test for testing i. Goodness of fit. ii. Independence of attributes. 2.6 Describe test procedure for testing $H_0: \sigma_1^2 = \sigma_2^2$ against $H_1: \sigma_1^2 \neq \sigma_2^2$ (test based on F-distribution).	
3	Confidence interval	6
	3.1 Definition of confidence interval (CI), importance of confidence intervals in statistical inference, Confidence level and margin of error. 3.2 CI for mean when population variance (σ^2) is known (using Z-distribution), CI for mean when population variance is unknown (using t-distribution). 3.3 CI for difference in means ($\mu_1 - \mu_2$), with known and unknown variances. 3.4 CI for proportion. 3.5 Examples and problems.	
4	Non-parametric Tests	10
	4.1 Introduction of non-parametric test, difference between parametric and non-parametric test. 4.2 sign test, run test, Kolmogorov– Smirnov test (For Normal and Uniform distribution), Mann Whitney test, median test.	
	References: 1. Gupta S.C. (2018). Fundamentals of Statistics: Himalaya Publishing House 2. Gupta S.C., Gupta Indra (2018) Business Statistics Himalaya Publishing House 3. Gupta S.C., Kapoor V.K.(2014). Fundamentals of Mathematical Statistics, Sultan Chand & Sons publication, Delhi 4. Gupta S.P. (2017) . Statistical Methods, Sultan Chand & Sons publication, Delhi.	

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Third Year of B.Com. (NEP-2024)

Course Code: 24CoBstU5104

Course Name: Applied Statistics I

Teaching Scheme: 4 Hours/Week

Credit: 2

Examination Scheme: CIA: 20 Marks

End-Sem: 30 Marks

Prerequisite Courses: Basic Mathematics, Knowledge of the topics of Probability and Probability Distributions.

Course Objectives:

- To study the concept of attributes.
- To study the various vital events and their measures

Course Outcomes:

On completion of the course, student will be able to–

1. Analyze the qualitative data.
2. Study the interrelation between two qualitative characteristics using coefficient of association.
3. Learn application of vital events and their measures in real life situation.
4. Understand and Construct Life Tables
5. Interpret Key Life Table Functions
6. Apply Life Table Functions to Real-life Problems

1	Analysis of contingency table	12
	1.1 Introduction of classification 1.2 Notation, dichotomy, types of classes, Order of a class, dot operator to find relation between class frequency (up to order three attribute), Fundamental set of class frequencies, 1.3 Consistency up to three attributes, Independent and Association of two attributes. 1.4 Yule's Coefficient of association, examples and problems.	
2	Vital Statistics	10
	2.1 Introduction, Methods of collecting vital Statistics, Mortality rates : CDR, ASDR, STDR (direct method) 2.2 Fertility rates: CBR, ASFR, TFR, GFR Population Growth rate: GRR and NRR, examples and problems.	
3	Life Tables	8
	3.1 Introduction, Construction of life table 3.2 Functions (l_x , L_x , p_x , q_x , e_x , T_x) and their interpretation 3.3 Expectation of life, examples and problems.	
	References: 1. Gupta S.C. (2018). Fundamentals of Statistics: Himalaya Publishing House 2. Gupta S.C., Gupta Indra (2018). Business Statistics ,Himalaya Publishing House 3. Gupta S.C., Kapoor V.K.(2014). Fundamentals of	

	Mathematical Statistics, Sultan Chand & Sons publication, Delhi	
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Progressive Education Society's

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Third Year of B.Com. (NEP-2024)

Course Code: 24CoBstU5501

Course Name: Lab Course on Statistics - III

Teaching Scheme: 4 Hours/Week

Credit: 2

Examination Scheme: CIA: 20 Marks

End-Sem: 30 Marks

Prerequisite Courses: Knowledge of the topics in discrete probability distributions .

Course Objectives:

- To learn to represent the data with the help of diagrams and graphs.
- To learn to interpret the data using diagrams and graphs.
- To study concept of measures of central tendency.
- To study concept of measures of dispersion.

Course Outcomes:

On completion of the course, student will be able to:

- use various graphical and diagrammatic techniques and interpret.
- compute various measures of central tendency, dispersion.
- interpret summary statistics of output generated by Computer Software.
- summarize and analyze the data using Computer Software.

Course Contents

Sr.No.	Title of Experiment/ Practical
1	Application of uniform distribution
2	Application of normal distribution
3	Fitting of normal distribution
4	Testing of hypotheses I (approximate tests)
5	Testing of hypotheses II (exact tests)
6	Applications of Chi-square distribution and F distribution
7	Non parametric test I (sign test, run test)
8	Non parametric test II (Kolmogorov– Smirnov test (For Normal and Uniform distribution), Mann Whitney test, median test)
9	Problems on contingency table
10	Computation of birth rate and fertility rates
11	Computation of death rate and mortality rates
12	Life table
13-15	Experiential learning

Progressive Education Society's
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Third Year of B. Com. Semester VI (NEP-2024)

Course Code: 24CoBstU6103

Course Name: Operations Management.

Teaching Scheme: 4 Hours/Week

Credit: 4

Examination Scheme: CIA: 40 Marks

End-Sem: 60 Marks

Prerequisites Courses:

- Knowledge of probability models.

Course Objectives: To study

- different optimization techniques.
- different charts.
- simulation.

Course Outcomes:

On completion of the course, student will be able to—

1. Learn various method of operational research.
2. Obtain optimal solution and apply it to real life data
3. Implement decision theory to take a decision in real life situations.
4. Implement Game theory to take a decision in real life situations.
5. Obtain critical path for various projects using CPM and PERT method.
6. Derive various inventory models to inventory problems in real life situations.

Course Contents:

	Title and content	Lectures
1	Game Theory	10
	1.1 Meaning, two person zero-sum game, 1.2 pure and mix strategies, Pay off tables, saddle points, minimax and maximin principles, Dominance principles. 1.3 Examples and problems.	
2	Statistical Decision Theory	16
	2.1 Introduction, acts, states of nature, pay off, regret, 2.2 Decision Making Under Risk, Expected Opportunity Loss (EOL) Criterion and Expected Monetary Value (EMV) Criterion. 2.3 Decision Making Under Uncertainty, maximin criterion,	

	maximax, minimax regret criterion, Laplace criterion, Hurvitz criterion, 2.4 Examples and problems. (using Excel)	
3	CPM/PERT	18
	3.1 Meaning and scope, activity, event, node, network, path, critical path, slack, float (total, free, independent), forward pass and backward pass methods. 3.2 Pessimistic, Most likely and Optimistic times in PERT, mean and variance for each activity, expected duration of project, probability of completion of project, 3.3 Examples and problems.	
4	Inventory Model	16
	4.1 Meaning of inventory control, Factors involved in inventory problem analysis, 4.2 EOQ model with constant rate of Demand, 4.3 EOQ model with different rates of demand, 4.4 EOQ model with constant demand and variable order cycle time and examples	
	References: 1. Gupta S.C. (2018). Fundamentals of Statistics: Himalaya Publishing House 2. HamdyTaha(2008). Operations Research , Pearson Com. 3. KapoorV.K.(2013). Operations Research: Sultan Chand & Sons 4. SwarupKanti ,Gupta P.K., Man Mohan (2010). Operations Research, Sulthanchand. 5. Montgomery D.C. (2008).Statistical Quality Control:John Wiley & Sons.	

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Course Code: 24CoBstU6104

Course Name: Applied Statistics II

Teaching Scheme: 2 Hours/Week

Credit: 2

Examination Scheme: CIA: 20 Marks

End-Sem : 30 Marks

Prerequisites Courses:

- Knowledge of probability models.

Course Objectives: To study

- different optimization techniques.
- different charts.
- To study simulation.

Course Outcomes : On completion of the course, student will be able to–

1. Explain the components of time series (trend, seasonal, cyclical, and irregular variations) and their significance in forecasting.
2. Apply trend estimation techniques such as moving averages, trend line fitting, and
3. exponential smoothing for time series data analysis.
4. Understand the concept, scope, advantages, and limitations of simulation in business and statistical decision-making.
5. Develop simulation models using Excel to generate random samples from uniform and normal distributions using the Box-Muller transformation.
6. Analyze the fundamentals of demand, including the law of demand and factors influencing consumer behavior.
7. Evaluate different types of demand elasticity (price, income, and cross elasticity) and apply them in business and economic decision-making.

1	Time Series	18
	1.1 Introduction, Definition, Components of Time Series. 1.2 The Trend, Seasonal variation , Cyclical variation, Irregular variation, Methods of estimating Trends, Moving averages (with periods 3,4,5). 1.3 Fitting of trend line and second degree curve. 1.4 Exponential smoothing, Example and problems. 1.5 Seasonality method-simple average method.	

2	Simulation	06
	2.1 Meaning and scope, Advantages and disadvantages of simulations, 2.2 Examples and problems, from i) uniform distribution and ii) normal distribution using Box-Muller transformation.	
3	Demand analysis	06
	3.1 Fundamentals of demand, including the law of demand, 3.2 Factors influencing demand, demand curves, elasticity, and different types of demand, along with applications in business and economics.	
	References: 1. Gupta S.C. (2018). Fundamentals of Statistics: Himalaya Publishing House 2. Harndy Taha(2008). Operations Research , Pearson Com. 3. Gupta S.C., Kapoor V.K.(2014). Applied Statistics, Sultan Chand & Sons publication, Delhi	

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Course Code: 24CoBstU6501

Course Name: Lab Course on Statistics IV

Teaching Scheme: 4 Hours/Week

Credit: 2

Examination Scheme: CIA: 20 Marks

End-Sem: 30 Marks

Prerequisite Courses: Knowledge of the topics in discrete probability distributions .

Course Objectives:

- To learn to represent the data with the help of diagrams and graphs.
- To learn to interpret the data using diagrams and graphs.
- To study concept of measures of central tendency.
- To study concept of measures of dispersion.

Course Outcomes:

On completion of the course, student will be able to:

- use various optimization techniques and interpret.
- able to apply various time series techniques.

Course Contents

Sr.No.	Title of Experiment/ Practical
1	Applications of Game theory
2	Statistical decision theory I.
3	Statistical decision theory II.
4	PERT and CPM –I.
5	PERT and CPM –II.
6	Applications of inventory management –I.
7	Applications of inventory management –II.
8	Estimation and elimination of trend component using least square method.
9	Estimation and elimination of trend component using Moving average method.
10	Estimation and elimination of trend component using exponential

	smoothing method.
11	Estimation of seasonality by simple average method.
12	Applications of demand analysis.
13-15	Experiential learning.