Semester III

Progressive Education Society's

Modern College of Arts, Science and Commerce,

Shivajinagar, Pune - 5

Second Year of B.Com

(NEP 24)

Course Code:24CoBstU3102

Course Name: Discrete Probability Distributions I

Teaching Scheme: 2 Hours/Week **Credit: 2**

Examination Scheme: CIA: 20 Marks **End-Sem: 30 Marks**

Course Outcomes:

1. Understand Fundamental Probability Concepts
2. Apply the rules of probability, including conditional probability, independence of events, and Bayes' theorem, to solve real-world problems
3. Analyze Discrete Random Variables
4. Compute and interpret the mean, variance, and standard deviation of discrete probability distributions.
5. Explain and apply the properties of distribution functions in solving probability-related problems.
6. Develop Problem-Solving Skills with Probability Models

Course Content:

Unit	Title and content	Lectures
1	**Introduction to probability**	**15**
	1.1 Definitions of: Permutation, Combination, Sample Space, Event. 1.2 Types of events, Probability of an event. 1.3 Conditional Probability, Independence of two events. compound law for two random variable 1.4 Partition of sample space. Bayes Theorem (statement only)Examples and problems.	
2	**Univariate Discrete Probability Distributions**	**15**
	2.1 Definitions of : random variable, discrete random variable. 2.2 Probability distribution of discrete random variable, Probability mass function (p.m.f.), Cumulative distribution function. 2.3 Mean, Median, Mode, Variance and Standard deviation 2.4 Properties of distribution function.	

	2.5 Discrete uniform distribution, Bernoulli Distribution and Binomial Distribution 2.6 Examples and problems.	

References:

1. Dixit P.G. , Kapre P.S., Pawgi V. R. Discrete Probability Distribution, Time Series And R Software, Nirali Prakashan.
2. Goon A. M., Gupta, M. K. and Dasgupta, B. (1986), Fundamentals of Statistics, Vol. 2, World Press,Kolkata.
3. Gupta, S. C. and Kapoor, V. K. (2002), Fundamentals of Mathematical Statistics, Eleventh Edition), Sultan Chand and Sons, 23, Daryaganj, New Delhi , 110002 .
4. Gupta, S. C. and Kapoor V. K. (2007), Fundamentals of Applied Statistics (Fourth Edition), Sultan Chand and Sons, New Delhi.
5. Gupta S.C., Kapoor ,V.K.(2014). Fundamentals of Mathematical Statistics, Sultan Chand & Sons publication, Delhi
6. Mukhopadhya Parimal (1999), Applied Statistics, New Central Book Agency, Pvt. Ltd. Kolkata

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Course Code: 24CoBstU3103

Course Name: Optimization Techniques I

Teaching Scheme: 2 Hours/Week **Credit: 2**

Examination Scheme: CIA:20 Marks **End-Sem: 30 Marks**

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

1. Understand the Fundamentals of Linear Programming
2. Formulate Linear Programming Models
3. Solve LPP Using Graphical and Simplex Methods
4. Interpret Special Cases in LPP
5. Explain the canonical and standard forms of LPP and describe the duality relationship between primal and dual problems.
6. Understand and solve replacement problems for items that deteriorate over time when the value of money remains constant.

Unit	Title and content	lectures
1	**Linear programming problem**	20
	1.1 Definition and terms in a linear programming problem. 1.2 Formulation of linear programming problem 1.3 Solution by Graphical Method 1.4 Canonical and standard form, duality, relation between primal and dual 1.5 Meaning of unbounded solution, basic feasible solution, alternate solution, degenerate solution. 1.6 Examples and problems on simplex method	
2	**Replacement Problem**	**10**
	2.1 Introduction 2.2 Replacement of item that deteriorates with time when (a) value of money remains sameduring the period. (b) value of money changes during the period.	

References:

1. HamdyTaha(2008). Operations Research , Pearson Com.
2. Gupta, P.K. and Hira, D.S.(2008). Operation Research, 3 rd edition S. Chand and company Ltd., New Delhi.
3. Gupta S.C. (2018). Fundamentals of Statistics: Himalaya
4. Publishing House
5. Kapoor, V. K.(2006). Operations Research, S. Chand and Sons. New Delhi.
6. KapoorV. K.(2013). Operations Research: Sultan Chand & Sons
7. Swarup Kanti , Gupta P.K., Man Mohan (2010). Operations Research, Sulthan chand.

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Course Code: 24CoBstU3501

Course Name: Lab Course on Statistics I

Teaching Scheme: 4Hours/Week **Credit: 02**

Examination Scheme: CIA: 20 Marks **End-Sem: 30 Marks**

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

1. Compute probability using permutation and combination.
2. Apply the concept of probability and probability distribution in real life.
3. Learn various methods of operation research
4. understand to formulate the linear programming problem
5. Solve linear programming problem
6. Apply replacement model to decide the replacement year in real life situation

Course Contents

Sr.No.	Title of Experiment/ Practical
1	Problems based on permutation and combination -I
2	Problems based on permutation and combination- II
3	Problems on probability and conditional probability.
4	Problems of independences of two events and Bayes' theorem.
5	Problems based on Univariate probability distribution
6	Applications of Uniform, Bernoulli and Binomial distributions.
7	Formulation of LPP
8	Solving LPP using graphical method (Cases: feasible solution ,infeasible solution, no solution, unbounded solution, alternate solution)
9	Solving LPP using simplex method I (Cases: feasible solution ,infeasible solution, unbounded solution, alternate solution)
10	Solving LPP using simplex method II (Cases: feasible solution ,infeasible solution, unbounded solution, alternate solution)
11	Replacement problem I
12	Replacement problem II
13-15	Experiential Learning

SEMESTER IV

Progressive Education Society's

Modern College of Arts, Science and Commerce,

Shivajinagar, Pune - 5

Second Year of B.Com

NEP 24

Course Code: 24CoBstU4102

Course Name: Discrete probability Distributions II

Teaching Scheme: 2 Hours/Week **Credit : 2**

Examination Scheme: CIA: 20 Marks **End-Sem: 30 Marks**

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

1. Understand Standard Discrete Distributions
2. Apply Discrete Distributions to Real-Life Situations
3. Analyze Bivariate Discrete Random Variables
4. Compute Marginal and Conditional Distributions
5. Determine the independence of two random variables using joint, marginal, and conditional distributions
6. Apply standard discrete and bivariate probability distributions to solve practical problems and interpret the results.

Unit	Title and content	Lectures
1	**Some Standard Discrete Probability Distributions**	**16**
	1.1 Bernoulli: p.m.f., mean and variance. (statement only) 1.2 Binomial: p.m.f., mean, variance and additive property. (statement only) real life situation. 1.3 Poisson: p.m.f., mean, variance and additive property. (statement only) real life situation. 1.4 Geometric distribution: p.m.f., mean, variance and additive property.(statement only) real life situation. 1.5 Negative binomial distribution: p.m.f., mean, variance and additive property.(statement only) real life situation. 1.6 Hypergeometric distribution: p.m.f., mean, variance and additive property.(statement only) real life situation. 1.7 Examples and problems	
2	**Bivariate Discrete Probability Distribution**	**14**
	2.1 Bivariate discrete random variable, 2.2 Joint probability distribution of bivariate discrete random variable. 2.3 marginal and conditional distribution 2.4 Independence of two variables. 2.5 Examples and problems**.**	

References:

1. Dixit P.G. , Kapre P.S., Pawgi V. R. Discrete Probability Distribution, Time Series And R Software, Nirali Prakashan.
2. Goon A. M., Gupta, M. K. and Dasgupta, B. (1986), Fundamentals of Statistics, Vol. 2, World Press,Kolkata.
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Course Code: 24CoBstU4103

Course Name: Optimization Techniques II

Teaching Scheme: 2 Hours/Week **Credit: 02**

Examination Scheme: CIA: 20 Marks **End-Sem: 30 Marks**

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

1. Understand Transportation and Assignment Problems
2. Apply methods to find initial and optimal solution
3. Apply the Hungarian method to solve both minimization and maximization assignment problems.
4. Formulate and solve sequencing problems involving two machines with n-jobs and three machines reducible to two machines.
5. Calculate Total Elapsed Time and Idle Time
6. Develop Problem-Solving Skills in Optimization

Unit	Title and content	lectures
1	Transportation Problem (T.P).	14
	1.1 Introduction, balanced and unbalanced TP 1.2 Initial Basic Feasible Solution(IBFS) using NWCR, MMM, VAM, 1.3 Optimal solution usingMODI method 1.4 Examples and problems.	
2	Assignment Problem (A.P):	6
	2.1 Introduction of Assignment Problem (A.P). 2.2 Concepts of minimization and maximization. 2.3 Hungarian method of solving AP 2.4 Examples and problems	
3	Sequencing problem	10
	3.1 Statement of sequencing problem of two machines and n-jobs, 3.2 Statement of sequencing problem of three machines and n jobs 3.3 Calculation of total elapsed time, idle time of a machine. 3.4 Examples and problems.	

References:

1. HamdyTaha(2008). Operations Research , Pearson Com.
2. Gupta, P.K. and Hira, D.S.(2008). Operation Research, 3 rd edition S. Chand and company Ltd., New Delhi.
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Course Code: 24CoBstU4501

Course Name: Lab Course on Statistics II

Teaching Scheme: 4 Hours/Week **Credit: 02**

Examination Scheme: CIA: 20 Marks **End-Sem: 30 Marks**

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

1. Identify different real life situation where standard discrete finite sample space probability distribution can be applied.
2. Identify different real life situation where standard discrete infinite sample space probability distribution can be applied.
3. Compute probabilities for different standard discrete probability distribution.
4. Compute probabilities for different standard bivariate probability distribution.
5. Apply transportation and assignment problem on real life situations
6. Understand the applications of sequencing problems on real life situations.

Course Contents:

Sr.No.	Title of Experiment/ Practical
1	Application of Poisson and geometric distribution.
2	Fitting of Poisson distribution and computation of expected frequency.
3	Application geometric distribution.
4	Model sampling from Poisson distribution
5	Application hypergeometric distribution.
6	Application negative binomial distribution.
7	Computation of bivariate probability distribution
8	Introduction to Transportation problem (TP) and finding initial basic feasible solution using least cost method, Vogel's approximation method.
9	Finding Optimal solution of TP using modified distribution method.
10	Solving an Assignment problem using Hungarian method
11	Sequencing problem I (two machines)
12	Sequencing problem II (three machines)
13-15	Experiential learning