B. Sc. Statistics (Faculty of Science)
Third year Semester (VI)

Course Code	US06MISTA01	Title of the Course	PROBABILITY DISTRIBUTIONS
Total Credits of the Course	02	Hours per Week	02

Course Objectives:	1. Introduce Probability Distributions: To provide a fundamental understanding of probability distributions and their role in modeling random phenomena. 2. Understand Discrete Distributions: To introduce students to discrete probability distributions such as Binomial, Poisson, and Geometric distributions, and their applications. 3. Understand Continuous Distributions: To familiarize students with continuous probability distributions like Normal, Exponential, and Uniform distributions, and their significance in real-life scenarios. 4. Calculate Measures of Distribution: To enable students to compute and interpret measures such as mean, variance, and standard deviation for different probability distributions. 5. Model Real-World Problems: To develop the ability to model and solve real-world problems using appropriate probability distributions.

Course Content		
Unit	Description	Weightage* (%)
I	Discrete probability distributions: Bernoulli distribution, Binomial distribution, Poisson distribution, Geometric distribution, Negative binomial distribution, Hyper geometric distribution, Discrete uniform distribution, Mean variance, m.g.f, p.g.f and c.g.f. and its applications	50%
II	Continuous probability distributions: Continuous uniform distribution, Normal distribution, mean variance, m.g.f, p.g.f and c.g.f. and its applications, Exponential distribution, Gamma distribution, Beta distribution of first and second kind, Mean variance, m.g.f, p.g.f and c.g.f. and its applications	50%

Teaching-Learning Methodology	Interactive Class Lectures, ICT Tools, hand on experience in problem solving through practical sessions.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Analyse Discrete Probability Distributions: Apply and interpret discrete probability distributions such as Binomial, Poisson, Geometric, and Hypergeometric distributions in real-life scenarios.
2.	Analyse Continuous Probability Distributions: Understand and apply continuous probability distributions such as Normal, Exponential, and Uniform distributions to solve practical problems.
3.	Calculate Mean, Variance, and Higher Moments: Compute the expected value, variance, standard deviation, and higher moments of various probability distributions.

Suggested Text Books/ References:	
Sr. No.	Text Books
1.	Gupta S.C. and Kapoor V.K.: Fundamentals of Mathematical Statistics
2.	Mood A.M. and Graybill F.A. and Boes D.C.E.: Introduction to theory of statistics
3.	Hogg and Craig: Introduction to Mathematical Statistics
4.	Biswas Purna Chandra: Probability & Statistics (PHI Edition)

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B. Sc. Statistics (Faculty of Science)
Third Year Semester (VI)

Course Code	US06MISTA02	Title of the Course	STATISTICS PRACTICAL
Total Credits of the Course	02	Hours per Week	04

Course Objectives:	1. Teach Data Fitting Techniques: To equip students with the ability to fit theoretical probability distributions to real-world data using statistical methods. 2. Enhance Practical Application Skills: To enable students to apply knowledge of probability theory in fitting and analyzing distributions using experimental or collected data. 3. Develop Computational Skills: To provide hands-on experience in computing parameters (mean, variance, standard deviation) and fitting probability distributions manually and using statistical software. 4. Interpret Goodness of Fit: To teach students how to measure the goodness of fit of a distribution to given data using methods like the Chi-square test

Course Content	
Sr. No	List of Practicals
1	Fitting of Binomial distribution
2	Fitting of Poisson distribution
3	Fitting of Geometric distribution
4	Fitting of Negative Binomial distribution
5	Fitting of Discrete uniform distribution
6	Fitting of Normal distribution
7	Fitting of an Exponential distribution

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SARDARPATELUNIVERSITY
Vallabh Vidyanagar, Gujarat
(Reaccredited with 'A' Grade by NAAC (CGPA3.11)

Syllabus with effect from the Academic Year 2026-2027

B. Sc. Statistics (Faculty of Science)
Third year Semester (VI)

Course Code	US06MISTA03	Title of the Course	Operation Research
Total Credits of the Course	02	Hours per Week	02

Course Objectives:	• Operational Research (OR) is a scientific approach to decision-making that aims to improve the efficiency and effectiveness of systems through the use of advanced analytical techniques. It originated during World War II to assist military planners in solving complex strategic and tactical problems. • Operational Research is an interdisciplinary field that draws upon concepts and methods from Mathematics, Statistics, Information Technology, Economics, Engineering, and other disciplines to analyze and solve decision-making problems. • In modern times, Operational Research has developed into a professional discipline concerned with the application of scientific methods and quantitative techniques for decision-making, particularly in the optimal allocation of scarce resources.

Course Content		
Unit	Description	Weightage* (%)
I	Linear Programming Problem • General Mathematical Model of a Linear Programming Problem (LPP) • Types of Linear Programming Problem (LPP) Models: Standard Form and Canonical Form • Definitions of Key Terms in Linear Programming: Objective Function (Maximization and Minimization), Constraints (Equality and Inequality Constraints), Non-Negativity Restrictions, Decision Variables, Slack Variables, Surplus Variables, Artificial Variables, and Optimal Solution. • Simple Mathematical Formulation of Linear Programming Problems with Three Decision Variables Solution of Linear Programming Problems-I • Graphical Solution of Linear Programming Problems using the Extreme Point Method • Graphical Solution of Linear Programming Problems using the Iso-Profit/Cost Line. • Graphical Analysis of Optimal, Multiple Optimal, Infeasible, and Unbounded Solutions in Linear Programming Problems.	50%
II	Solution of Linear Programming Problems-II • Study of Basic Solution, Basic Feasible Solution, and Degenerate Solution in Linear Programming Problems (LPP)	

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	• Simplex Method for Solving Two-Variable Linear Programming Problems for Maximization Case. • Simplex Method for Solving Two-Variable Linear Programming Problems for Minimization Case Using Big-M Method. • Simplex Method for Solving Two-Variable Linear Programming Problems for Minimization Case Using Two Phase method. Concept of Duality in Linear Programming Problems • Definition and Concept of Primal and Dual Problems in Linear Programming. • Standard Results on Duality for Linear Programming Problems with Two Decision Variables.	50%

Teaching-Learning Methodology	Interactive Class Lectures, ICT Tools, hand on experience in problem solving through practical sessions.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Attendance (As per CBCS R.6.8.3)	
3.	University Examination	

Course Outcomes: Having completed this course, the learner will be able to	
1.	The courses in Operational Research provide a balanced combination of theoretical knowledge, practical skills, and real-world problem-solving experience. They are designed to equip students with analytical abilities and decision-making skills required to succeed in today's competitive environment.

Suggested Text Books/ References:	
Sr. No.	Text Books
1.	Kanti Swarup, Gupta, P. K., & Man Mohan. (2010). *Operations research*. Sultan Chand & Sons.
2.	Hillier, F. S., & Lieberman, G. J. (2015). *Introduction to operations research* (10th ed.). McGraw-Hill Education.
3.	Panneerselvam, R.(2023).*Operations Research*. (3rd ed.). PHI Learning Pvt. Ltd.
4.	Kapoor V.K. (2014). *Operation Research* (*Quantitative Techniques for Management*) (1st ed.). Sultan Chand and Sons.
5.	Rama Murthy, P.(2007). *Operation Research*(2nd ed.). New Age International (P) Limited, Publishers.

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Syllabus with effect from theAcademicYear2026-2027

B.Sc. Statistics (Faculty of Science)
Third year Semester (VI)

Course Code	US06MISTA04	Title of the Course	Practical based on Operation Research
Total Credits of the Course	02	Hours per Week	04

Course Objectives:	• Operational Research (OR) is a scientific approach to decision-making that aims to improve the efficiency and effectiveness of systems through the use of advanced analytical techniques. It originated during World War II to assist military planners in solving complex strategic and tactical problems. • Operational Research is an interdisciplinary field that draws upon concepts and methods from Mathematics, Statistics, Information Technology, Economics, Engineering, and other disciplines to analyze and solve decision-making problems. • In modern times, Operational Research has developed into a professional discipline concerned with the application of scientific methods and quantitative techniques for decision-making, particularly in the optimal allocation of scarce resources.

List of Practicals

Sr.	Manual
1	Mathematical Formulation of Linear Programming Problems for Decision-Making
2	Graphical Solution of Linear Programming Problems Using the Extreme Point Method
3	Graphical Solution of Linear Programming Problems Using the Iso-Profit/Iso-Cost line.
4	Graphical Analysis of Unbounded, Infeasible, and Multiple Optimal Solutions in Linear Programming Problem.
5	Simplex Method for Solving Linear Programming Problems with Two Decision Variables (Maximization Case)
6	Simplex Solution of Minimization LPPs with Two Decision Variables Using the Big-M Technique.
7	Simplex Solution of Minimization LPPs with Two Decision Variables Using the Two-Phase method.
8	Derivation of the Dual Problem from the Solution of the Primal Linear Programming Problem.

References

Sr. No.	Text Books
1.	Kanti Swarup, Gupta, P. K., & Man Mohan. (2010). *Operations research*. Sultan Chand & Sons.

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2.	Hillier, F. S., & Lieberman, G. J. (2015). *Introduction to operations research* (10th ed.). McGraw-Hill Education.
3.	Panneerselvam, R.(2023).*Operations Research*, (3rd ed.). PHI Learning Pvt. Ltd.
4.	Kapoor V.K. (2014). *Operation Research* (*Quantitative Techniques for Management*) (1st ed.). Sultan Chand and Sons.
5.	Rama Murthy, P.(2007). *Operation Research*(2nd ed.). New Age International (P) Limited, Publishers.

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