

COURSE OBJECTIVES

- The course aims at building capabilities in the students for analyzing different situations in the industrial/ business scenario involving limited resources and finding the best feasible solution (Optimum Solution) within constraints.
- The objective of this course is to enable the student to understand and analyze managerial problems to equip him/ her to use the resources such as capitals, materials, production controlling, directing, staffing, and machines more effectively.

- **PRE – REQUISITE**
- The world of Operations Research is dynamic and fast paced. It is also the blending of mathematics, optimization, statistics, and computer science, techniques to improve decision making, processes and systems. The learners should have knowledge of mathematics up to higher school level to learn basic contents of Operations Research.

- **CO – REQUISITE**
- The learner should have basic understanding of management and economic concepts.

COURSE OUTCOMES

- Understanding the basic concept and working of O.R. to solve the Industrial/Organizational problem in optimum manner.
- Solve linear programming problems using appropriate technique and interpret the results obtained.
- Determine feasible strategy for Minimization of Cost of shipping of products from source to Destination using various methods, finding initial basic feasible solution of the Transportation problems.
- Optimize the allocation of resources to Demand points in the best possible way using various techniques and minimize the cost or time of completion of number of jobs by number of persons as well as maximize the profit or sale.

- Allocation of work to appropriate persons to minimize the cost or time or to maximize the profit.
- To know the appropriate time to replace the machine for getting maximum benefit.

UNIT	CONTENT	WEIGHTAGE
1	INTRODUCTION TO OPERATIONS RESEARCH <ul style="list-style-type: none"> ➤ Origin of OR ➤ Definitions of Operations Research (OR) ➤ Nature and Scope of OR ➤ Characteristics of OR ➤ Phases of OR ➤ Limitations of OR ➤ Different types of Models in OR ➤ Applications of OR in the fields of Marketing, Financial Planning ➤ Different Techniques of OR 	25%
2	LINEAR PROGRAMMING PROBLEM (LPP) <ul style="list-style-type: none"> ➤ Meaning of Linear Programming Problems (LPP) ➤ Advantages / Uses, Assumptions and Limitations of LPP ➤ Understanding of Terms used in LPP ➤ Mathematical form of LPP ➤ Conversion of practical problem into mathematical form up to 3 variables only ➤ Solution of LP problem for two variables only by graphical method 	25%
3	TRANSPORTATION PROBLEM (TP) <ul style="list-style-type: none"> ➤ Meaning of balanced and unbalanced Transportation Problem (TP) ➤ General Transportation table and its mathematical form ➤ Initial basic feasible solution (IBFS) and its cost By using <ul style="list-style-type: none"> • North-West Corner Method (NWCM), • Least Cost (Matrix Minima) Method (LCM) • Vogel's Approximation Method (VAM) ➤ Examples based on these methods 	25%
4	ASSIGNMENT PROBLEM (AP) AND REPLACEMENT PROBLEM (RP) <ul style="list-style-type: none"> ➤ Meaning of balanced Assignment Problem (AP) ➤ Mathematical form of AP ➤ Hungarian method for solving AP in the cases of Minimization and Maximization problem ➤ Meaning of Replacement Problem (RP) ➤ Simple examples of Replacement Problem when the units are deteriorating with time and the value of money remains unchanged 	25%

MODE OF EVALUATION

Evaluation will be divided in two parts.

- **External:** Semester end Examination will be conducted by the Gujarat University of
70 Marks
- **Internal:** Internal Evaluation of 30 marks will be decided by the colleges / Institutes/
University departments as per the instruction given by the University time
to time.

FBLD (Flip Blended Learning Design Template)

- Any One Unit from the above syllabus can be discussed by the faculty through online mode.
- Online mode can be SWAYAM MOOC Course or any other suggested by the UGC or Gujarat University.

REFERENCE BOOKS:

1. Operation Research - Kanti Swaroop
2. Operation Research : P. K. Gupta and Man Mohan
3. Operation Research : Dr R. V. S. Prasad
4. Operation Research : Dr. D. Giri
5. Operation Reach – S. D. Sharma and J. K. Sharma
6. Operations research - Models and methods by Chandrasekar Salimath, Bhupendar Parashar.
7. Operations Research – Taha
8. Operations Research – N. D. Vora

B. COM. (HONS)
SEMESTER – II
STATISTICS - II
COURSE CODE – MIC 102
CREDIT MARK DISTRIBUTION – 03

COURSE OBJECTIVES

- The course aims at edifice abilities in the students to make the best decision by comparing all the possible alternatives. These may help them to identify the problems in real sense and analyzing different situations in the day to day life.
- The objective of this course is to enable the student to understand and analyze decision making problems, to equip them to use the resources for taking the best decision.
- **PRE – REQUISITE**
The learners should have knowledge of mathematics up to higher school level to learn basic contents of decision making. A common goal provides a decision-making group with a rallying point that helps keep teams and organizations moving in the same direction. In addition, decision-makers can evaluate whether each individual decision generates progress toward the goal or at the very least which potential decision in any decision set will move the needle. It is also the amalgamation of mathematics and statistics to improve decision making, processes and systems.
- **CO – REQUISITE**
- The learner should have basic understanding of management and economic concepts.

COURSE OUTCOMES

- Ability to perceive the characteristics of the decision models. Ability to locate and select appropriate data to support decision models. Ability to analyze, investigate and evaluate a decision model.
- The intention of game theory is to produce optimal decision-making of independent and competing players in a strategic setting. Using game theory, real-world scenarios for such situations as pricing competition and product releases (and many more) can be laid out and their outcomes be predicted.
- PERT and CPM may provide powerful coordinating tools for planning, scheduling, controlling projects and minimization of total project time and effective resources as well as identifying the critical path of the project.

- Matrices as a tool for simplifying rigorous calculation of linear algebra. Understanding of terminology, notation and basic operations for matrices. Solving simultaneous linear systems of equations using inverse matrix method.

UNIT	CONTENT	WEIGHTAGE
1	<p>DECISION THEORY</p> <ul style="list-style-type: none"> ➤ Meaning and Importance of Decision Theory ➤ Components of Decision Theory ➤ Methods of taking decision <ul style="list-style-type: none"> Decisions under uncertainty <ul style="list-style-type: none"> • Maxi – Min Principle • Maxi – Max Principle • Laplace’s Principle • Hurwitz’s Principle Decisions under Risk <ul style="list-style-type: none"> • Expected Monetary Value (EMV) • Expected Profit under Perfect Information (EPPI) • Expected Value for Perfect Information (EVPI) ➤ Practical Problems relating to the stated Methods 	25%
2	<p>GAME THEORY</p> <ul style="list-style-type: none"> ➤ Meaning of Game ➤ Two Person Zero Sum Game: Meaning and assumptions ➤ Strategy and Pay – off matrix for two persons zero sum game ➤ Saddle point ➤ Pure strategy ➤ Value of the Game ➤ Mixed Strategy ➤ Algebraic method for Solving 2 x 2 Game without Saddle Point ➤ Dominance Principle ➤ Use of Dominance Principle to reduce size of game matrix into 2 x 2 matrix and solving it ➤ Simple Sums of Game Theory – with and without Saddle point (using dominance principle only) 	25%
3	<p>PERT AND CPM</p> <ul style="list-style-type: none"> • Meaning and Characteristics of Programme Evaluation and Review Technique (PERT) • Meaning of Critical Path Method (CPM) • Uses and Limitations of PERT and CPM • Difference between PERT and CPM • Explanation of basic terms such as <ul style="list-style-type: none"> • Activity • Event 	25%

	<ul style="list-style-type: none"> • Dummy Activity • Optimistic Time • Pessimistic Time • Most Likely Time • Expected Time • Fulkerson’s Rules for numbering the event • Earliest Starting Time (EST) • Earliest Finish Time (EFT) • Latest Starting Time (LST) • Latest Finish Time (LFT) • Total Float Time • Simple Examples on the basis of all above 	
4	<p>MATRIX ALGEBRA</p> <ul style="list-style-type: none"> ➤ Definition of Matrix ➤ Different Types of Matrices ➤ Addition, Subtraction and Multiplication of Matrices and related examples ➤ Determinant of Square Matrix (up to order 3 x 3) ➤ Adjoint of Matrix and Inverse of a square Matrix (up to order 3 x 3) ➤ Solution of Simultaneous linear Equations systems with the help of Inverse Matrix (up to 3 variables) and related examples 	25%

MODE OF EVALUATION:

Evaluation will be divided in two parts.

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2. Operation Research: P. K. Gupta and Man Mohan
3. Operation Research – P. Rama Murthy
4. Operation Research: Dr R. V. S. Prasad
5. Operation Research: Dr. D. Giri
6. Operation Reach – S. D. Sharma and J. K. Sharma
7. Linear algebra – A. K. Sharma
8. Linear Algebra – Dr. P.K. Nayak
9. Basic Abstract Algebra – P. B. Bhattacharya, S. K. Jain and S. R. Nagpaul
10. Operations Research – N. D. Vora

B. COM. (HONS)

To be effective from June 2023

ID / MD SEMESTER – I

APPLICATION OF STATISTICS IN ECONOMICS

COURSE CODE – ID / MD 101 C

CREDIT MARK DISTRIBUTION – 03

COURSE OBJECTIVES

- The main objective of this course is to acquaint students with the bi-variate and multivariate statistical knowledge from the standpoint of both theory and applications of statistics. It helps learners in exploring the applications of statistics in different areas such as – Business, Social Science, Applied Sciences and Industries.
- The other objective of this course is to enable the student to understand as well as analyze live problems and cases and to equip them in taking decisions in higher studies/research.

PRE – REQUISITE:

- Bivariate analysis is an important statistical method because it lets learners look at the relationship between two or more variables and determine their relationship. This can be helpful in many different kinds of research, such as social science, medicine, marketing, and more. The learners should have knowledge of basic statistics up to higher secondary school level to learn basic contents of bi-variate and multivariate studies.

CO – REQUISITE:

- Prior to the course, the learners should familiarize themselves with concepts of variable (Understanding of Univariate, Bi-variate and Multivariate), qualitative and quantitative nature of data, basic statistical concepts such as average, variance and standard deviation etc.

COURSE OUTCOMES

- Be able to calculate and interpret the relation and measure between dependent and independent variable(s)
- Be able to develop and validate models on the basis of collected information for qualitative and quantitative analysis.

- Learning of basic concept of bi-variate and multivariate statistics enable in research and decision making which help them in higher studies and solve involved decision making problems.

UNIT	CONTENT	WEIGHTAGE
1	<p>LINEAR CORRELATION AND LINEAR REGRESSION</p> <ul style="list-style-type: none"> ➤ Meaning and Definition of Correlation ➤ Meaning of Linear Correlation for two variables ➤ Karl Pearson's Product Moment method ➤ Properties of Correlation Co-efficient ➤ Examples of correlation coefficient for Bi-variate frequency table (upto order 4 x 4 only) ➤ Co-efficient of determination and Interpretation ➤ Meaning and Definition of Regression ➤ Meaning of Linear Regression for two variables ➤ Need for two regression lines ➤ Definition and properties of Regression Co-efficient ➤ Examples based on regression Lines for Bivariate frequency table and short sums only on the basis of Properties of Correlation and Regression Coefficients. 	25%
2	<p>MULTIPLE AND PARTIAL CORRELATION</p> <ul style="list-style-type: none"> ➤ Definition and Concept of Multiple and Partial Correlation (For Three Variables only) ➤ Formula of Multiple correlation and partial Correlation ➤ Simple Numerical Example based on Formula 	25%
3	<p>MULTIPLE AND PARTIAL REGRESSION</p> <ul style="list-style-type: none"> ➤ Definition and Concept of Partial and Multiple Regression (For Three Variables only) ➤ Concept of Multiple Regression Equations ➤ Formula of Partial Regression Co-efficient and Multiple Regression Lines ➤ Simple Numerical Example based on Formula 	25%
4	<p>ASSOCIATION OF ATTRIBUTES</p> <ul style="list-style-type: none"> ➤ Concept of Qualitative Data ➤ Meaning of Association of Attributes ➤ Meaning and Interpretation of 2 x 2 Contingency Table ➤ Types of Association of Attributes ➤ Methods of Studying Association <ul style="list-style-type: none"> • Method of Observed and Expected Frequency • Method of Proportion • Yule's Method ➤ Examples Based on 2 x 2 Contingency table only 	25%

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REFERENCE BOOKS:

1. V. K. Kapoor – Fundamental of Mathematical Statistics
2. S. P. Gupta: Statistical methods
3. Bhat B. R. Srivenkatramana T. and Madhava Rao K. S. – Statistics: A Beginner's Text
4. Goon A. M., Gupta M. K. and Dasupta B. – Fundamentals of Statistics Vol. – I
5. Snedecor G. W. and Cochran W. G. – Statistical Methods
6. Waiker and Lev: Elementary Statistical Methods
7. D. C. Sancheti and V. K. Kapoor: Business Statistics
8. S. C. Gupta: Fundamentals of Statistics
9. P. N. Arora, Sumeet Arora and S. Arora: Comprehensive Statistical Methods

B. COM. (HONS)

To be effective from June 2023

ID / MD SEMESTER – II

MATHEMATICS FOR COMMERCE

COURSE CODE – ID / MD 102 C

CREDIT MARK DISTRIBUTION – 03

COURSE OBJECTIVES

- The course provides the students with knowledge of a range of mathematical and computational techniques that are required for a wide range of quantitative positions in the financial sector and to develop students' appreciation of the major issues involved in rigorous advances in the area of financial mathematics.

PRE – REQUISITE:

- The learners should have knowledge of basic Mathematics up to higher school level to learn concepts of financial mathematics.

CO – REQUISITE:

- The learner should be familiar with basic terminology such as simple interest, compound interest, annuity, present value, future value, sinking fund, sequence, series etc.

COURSE OUTCOMES

- The students would be enabled to understand the mathematical standards and foundations of quantitative finance and advanced methodologies and techniques of importance to a range of careers in investment banks and other financial institutions.
- Appreciation of emerging theory and techniques in the area of financial mathematics.
- Construct, Evaluate and Analyze in areas of investments, share and securities.
- It supports the learners in competitive exams.

UNIT	CONTENT	WEIGHTAGE
1	RATIO, PROPORTION, PERCENTAGE, PROFIT, LOSS AND DISCOUNT <ul style="list-style-type: none">➤ Meaning of Ratio and Inverse Ratio➤ Properties of Ratios➤ Mathematical Uses of Ratio➤ Meaning and Properties of Proportion and Examples of Proportion➤ Definition and Utility of Percentages➤ Concept of Percentages Change➤ Examples related to Percentages➤ Definition of Profit, Loss and Discount	25%

	<ul style="list-style-type: none"> ➤ Concept of Break Even Point ➤ Examples of Profit, Loss and Discount related to Commerce 	
2	ARITHMETIC PROGRESSION AND GEOMETRIC PROGRESSION (AP-GP) <ul style="list-style-type: none"> ➤ Meaning of Sequence and Series ➤ Introduction to Arithmetic progression and geometric progression ➤ n^{th} term and Sum of n terms of the AP&GP ➤ Arithmetic Mean ➤ Geometric Mean ➤ Application based examples 	25%
3	MATHEMATICS FOR FINANCE (TIME VALUE OF MONEY - I) <ul style="list-style-type: none"> ➤ Definition of: <ul style="list-style-type: none"> • Principal Amount • Rate of Interest • Number of Years or Time • Interest • Amount ➤ Types of Interest ➤ Calculation of Daily Interest ➤ Difference Between Simple and Compound Interest ➤ Conversion Period ➤ Effective Rate of Interest ➤ Depreciation, Compound Annual Growth Rate (CAGR) ➤ Simple Examples related to these topics 	25%
4	MATHEMATICS FOR FINANCE (TIME VALUE OF MONEY - II) <ul style="list-style-type: none"> ➤ Definition of Annuity ➤ Meaning of Regular Annuity and Due Annuity ➤ Future Value of Regular Annuity and due Annuity ➤ Concept of Sinking Fund ➤ Present Value of Regular and Due Annuity ➤ Application of Annuity in the Example of Sinking Fund ➤ Leasing ➤ Capital Expenditure (Investment Decision) ➤ Valuation of Bonds ➤ Loans ➤ Meaning of Perpetuity ➤ Simple Examples related to these topics 	25%

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REFERENCE BOOKS:

1. B. L. Bajpai – Financial Mathematics
2. S. K. Chakravarty – Financial Mathematics Paperback
3. A. Lenin Jothi – Financial Mathematics
4. Dr. S. P. Gupta and Dr. Sushil Kumar Jain – Financial Mathematics
5. Mark S. Joshi – The Concepts and Practice of Mathematical Finance
6. Mc Cutcheon and Scott – Introduction to the Mathematics of Finance
7. Paul Wilmott, Sam Howison and Jeff Dewynne- The Mathematics of Financial Derivatives
8. Ross S. M. – An introduction to Mathematical Finance