AC/II (20-21).2.RUS17

S. P. Mandali's

Ramnarain Ruia Autonomous College

(Affiliated to University of Mumbai)

Syllabus for

Program: T.Y.B.Sc.

Program Code: Elements of Operations Research (RUSACOR)

(Credit Based Semester and Grading System for academic year 2021–2022)

PROGRAM OUTCOMES

PO	PO Description **A student completing Bachelor's/Master's Degree in science program will be able to:**
PO 1	Recall and explain acquired scientific knowledge in a comprehensive manner and apply the skills acquired in their chosen discipline. Interpret scientific ideas and relate its interconnectedness to various fields in science.
PO 2	Evaluate scientific ideas critically, analyse problems, explore options for practical demonstrations, illustrate work plans and execute them, organise data and draw inferences.
PO 3	Explore and evaluate digital information and use it for knowledge upgradation. Apply relevant information so gathered for analysis and communication using appropriate digital tools.
PO 4	Ask relevant questions, understand scientific relevance, hypothesize a scientific problem, construct and execute a project plan and analyse results.
PO 5	Take complex challenges, work responsibly and independently, as well as in cohesion with a team for completion of a task. Communicate effectively, convincingly and in an articulate manner.
PO 6	Apply scientific information with sensitivity to values of different cultural groups. Disseminate scientific knowledge effectively for upliftment of the society.
PO 7	Follow ethical practices at work place and be unbiased and critical in interpretation of scientific data. Understand the environmental issues and explore sustainable solutions for it.
PO 8	Keep abreast with current scientific developments in the specific discipline and adapt to technological advancements for better application of scientific knowledge as a lifelong learner.

PROGRAM SPECIFIC OUTCOMES

PSO	Description **A student completing Bachelor's Degree in science program in the subject of Elements of Operations Research (AC) will be able to:**
PSO 1	Understand, condense, visualize, analyze and interpret the data collected in daily walk of life.
PSO 2	Understand the data generated in various scenarios of scientific, industrial, or social problems.
PSO 3	Pursue their higher education programs leading to post-graduate or doctoral degrees.
PSO 4	Enhance knowledge of Statistical tools.
PSO 5	Enhance the theoretical rigor with technical skills which prepare them to become globally competitive to enter into a promising professional life after graduation.
PSO 6	Make a pathway to a range of traditional avenues in Academia and Industry , Govt. Service, IAS, Indian Statistical/ Economic Services, Industries, Commerce, Investment Banking, Banks and Insurance Sectors, CSO and NSSO, Research Personnel/Investigator in Govt. organizations such as NCAER, IAMR, ICMR, Statistical and Economic Bureau & various PSUs., Market Research, Actuarial Sciences, Biostatistics, Demography etc.
PSO 7	Seek employment in different sectors like Stock trading, Sports, Politics, Business, Financial services and Media Industry.

PROGRAM OUTLINE

YEAR	SEM	COURSE CODE	COURSE TITLE	CREDITS
TYBSc	V	RUSACOR501	ELEMENTS OF OPERATIONS RESEARCH- I	2
TYBSc	V	RUSACORP501	PRACTICAL BASED ON RUACOR501	2
TYBSc	VI	RUSACOR601	ELEMENTS OF OPERATIONS RESEARCH –II	2
TYBSc	VI	RUSACORP601	PRACTICAL BASED ON RUSACOR601	2

Course Code: RUSACOR501

Course Title: ELEMENTS OF OPERATIONS RESEARCH- I

Academic year 2021-22

COURSE OUTCOMES:

COURSE OUTCOME	DESCRIPTION A student completing this course will be able to:
CO 1	Formulate and Solve LPP using Graphical method and mathematical methods. Perform Graphical Sensitivity
CO 2	Understand the concept of Duality. Perform Sensitivity Analysis.
CO 3	Apply network models
CO 4	Solve a transportation and its variants using various methods and optimise it. Solve a transhipment problem.

DETAILED SYLLABUS

Course Code/ Unit	Unit	Course/ Unit Title	Credits/ Lectures
RUSACOR501	Unit I	**Linear programming problem (LPP) and Graphical Sensitivity**: • Introduction, formation of LPP, solution of LPP using • Graphical method and Sensitivity • Simplex Method (with and without artificial variable) • Solution of LPP for unrestricted variables Two Phase Method	15 Lectures
RUSACOR501	Unit II	**Duality and Sensitivity analysis:** • Concept of Duality. • Its use in solving L.P.P. Relationship between optimum solutions to Primal and Dual. • Dual Simplex Algorithm. • Sensitivity analysis:-[With Proof] ➢ Variation in the price vector “c”. ➢ Variation in requirement vector “b”. ➢ Addition and deletion of a new variable to the LPP. ➢ Addition and deletion of a new constraint to the LPP.	15 Lectures
RUSACOR501	Unit III	**Network Models:-** • Objective and outline of CPM/PERT techniques.	15 Lectures

		• Critical path computation. Slack and Three float times. • Probability consideration in project scheduling. Project cost analysis. • Minimal Spanning and Shortest Route method	
RUSACOR501	**Unit IV**	**Transportation Problem:** • Concept, Mathematical Formulation. Initial Basic Feasible Solution by North-West Corner Rule, Matrix Minima Method, Vogel's Approximation Method. Optimal Solution by MODI Method. Optimality test, Improvement procedure. Variants in Transportation Problem: Unbalanced, Maximization type, Restricted allocations. • Transhipment Problem	15 Lectures

DISTRIBUTION OF TOPICS FOR PRACTICALS

Course Code RUSACORP501	
Sr. No	**Practicals based on course**
1	Formulation and Graphical solution with sensitivity
2	Two Phase Method
3	Duality And Dual Simplex
4	Sensitivity Analysis
5	PERT CPM 1
6	PERT CPM 2
7	Transportation Problems
8	Transhipment Problem

REFERENCES

1. Kantiswaroop and Manmohan Gupta.: Operations Research 4th Edition; S Chand & Sons.
2. Sharma J K, (1989),: Mathematical Models in Operations Research ,Tata McGraw Hill Publishing Company Ltd.
3. Sharma S D.: Operations Research 11th edition, KedarNath Ram Nath& Company.
4. Taha H A.: Operations Research 6th edition, Prentice Hall of India.
5. Sharma J K,: Quantitative Techniques For Managerial Decisions: , (2001), MacMillan India Ltd.
6. Kapoor V K. :Operation research technique for management 7th edition

7. Gupta R K. :Linear Programming , 2nd Edition
8. Gupta M P and Sharma J K.: Linear programming for management : 1st edition national publishing house
9. Shrinath L S: Principles and application: Pert and CPM. :Affiliated East West press pvt ltd
10. Ingels Franklin M: Information and coding Theory : Intext Educational publishers

Modality of Assessment

Theory Examination Pattern:

A) Internal Assessment- 40%- 40 Marks

Sr No	Evaluation type	Marks
1	Class Test/ Project / Assignment / Presentation	20
2	Class Test/ Project / Assignment / Presentation	20
	TOTAL	**40**

B) External Examination- 60%- 60 Marks

Semester End Theory Examination:

1. Duration - These examinations shall be of **two hours** duration.
2. Theory question paper pattern:

Paper Pattern:

Question	Options	Marks	Questions Based on
1	A	15	Unit I
	B or C		
2	A	15	Unit II
	B or C		
3	A	15	Unit III
	B or C		
4	A	15	Unit IV
	B or C		
	TOTAL	**60**	

Practical Examination Pattern:

A) Internal Examination: 20%- 20 Marks

Particulars	Marks
Journal	5
Experimental tasks/Project/Assignments	15
Total	**20**

B) External Examination: 80%- 80 Marks

Semester End Practical Examination:
Duration - These examinations shall be of **THREE HOURS** duration.

Particulars	Paper
EXAM	**RUSACORP501**
Total	**80**

Overall Examination & Marks Distribution Pattern

Semester V

Course	RUSACOR501		
	Internal	External	Total
Theory	40	60	100
Practicals	20	80	100

Course Code: RUSACOR601

Course Title: ELEMENTS OF OPERATIONS RESEARCH- II

Academic year 2021-22

COURSE OUTCOMES:

COURSE OUTCOME	DESCRIPTION A student completing this course will be able to:
CO 1	Solve a two-sum zero-sum game.
CO 2	Apply decision making under various criteria.
CO 3	Understand the various terminologies of information theory.
CO 4	Apply various methods in investment decisions
CO 5	Understand the concept of Mutual Funds and Investment Plans
CO 6	Distinguish between security markets and futures, forwards & options

DETAILED SYLLABUS

Course Code/ Unit	Unit	Course/ Unit Title	Credits/ Lectures
RUSACOR601	Unit I	**GAME THEORY** • Definitions of Two-person Zero Sum Game, Saddle Point, Value of the Game, Pure and Mixed strategy. Optimal solution of two-person zero sum games. • Dominance property, Derivation of formulae for (2x2) game. Graphical solution of (2xn) and (mx2) games. Solution to Game using Linear Programming Approach. **DECISION THEORY** • Decision making under uncertainty: Laplace criterion, Maximax (Minimin) criterion, Maximin (Minimax) criterion, Hurwicz α criterion, Minimax Regret criterion. • Decision making under risk: Expected Monetary Value criterion, Expected Opportunity Loss criterion, EPPI, EVPI. Bayesian Decision rule for Posterior analysis. • Decision tree analysis.	15 Lectures

RUSACOR601	**Unit II**	**Information theory** • Introduction. Fundamental Theorem of Information Theory. • Measures of Information. Properties of Entropy Function. • Communication System. Memory less channel, Binary Symmetric channel, channel matrix, joint, marginal and conditional Entropies. • H(X, Y) = H(X/Y) + H(Y) = H(Y/X) + H(X) H(X) ≥ H(X/Y) • Channel capacity, Efficiency and Redundancy, Encoding, Shannon–Fano Encoding Procedure.	15 Lectures
RUSACOR601	**Unit III**	**Mathematics of Finance, Mutual Funds** • Accumulated Value and Present Value of Single Payment and Series of Payments. • Application to investment decisions ➢ Payback Method ➢ Net present value Method (NPV), ➢ Internal Rate of Return Method **Mutual Funds (M.F)** • Introduction, Types of M.F, Net Asset Value (NAV), entry, exit loads. • Classification of M.Fs. option plans given by M.Fs. Evaluation of M.Fs • Advantages and Disadvantages of M.Fs • Simple problems on calculation of Net income after considering entry load, dividend, change in NAV and exit load. • Introduction to:-Investment Plans • Averaging of price under the ➢ Systematic Investment Plan (SIP) ➢ Systematic Withdrawal Plan (SWP) ➢ Systematic Transfer Plan (STP)	15 Lectures
RUSACOR601	**Unit IV**	**Securities Market, Futures & Options** • Concept of Index, Nifty-Fifty, Sensex, Dow Jones Index, Hang Seng Index • Concept of stock market, share, face value, market value, dividend, equity share, preferential share, bonus and right shares. • Initial Public Offer (IPO), Earning Per Share (EPS), Price Earnings Ratio (PE ratio), Price to Book Ratio (P/B Ratio), Beta value, Volatility index. Simple problems. **Options terminology:-** • Index option, Stock option, American option, European option. • Strike price, Expiry date, Call option, Put option, Buyer of an option, Writer of an option. **Futures & Options:-**	15 Lectures

		• Introduction to F & O market. • Difference between Forward and Futures contracts. • Factors influencing the market. • Hedging, Arbitrage, Open interest	

DISTRIBUTION OF TOPICS FOR PRACTICALS

Course Code RUSACORP501	
Sr. No	**Practicals based on course**
1	Game Theory
2	Decision Theory 1
3	Decision Theory 2
4	Information Theory
5	Investment Analysis
6	Mutual Funds
7	Market Analysis,
8	Futures And Options

REFERENCES

1. Kantiswarup and Manmohan Gupta.: Operations Research 4th Edition; S Chand & Sons.
2. Richard Bronson.: Schaum Series book in O.R 2nd edition Tata Mcgraw Hill Publishing Company Ltd.
3. Sasieni MauriceArthur Yaspan and Lawrence Friedman: Operations Research: Methods and Problems John Wiley & Sons.
4. Sharma J K: Mathematical Models in Operations Research ,Tata McGraw Hill Publishing Company Ltd. (1989)
5. Harvey M. Wagner: Principles of Operations Research with Applications to Management Decisions 2nd Edition, Prentice Hall of India Ltd.
6. Sharma S D.: Operations Research 11th edition, Kedar Nath Ram Nath & Company.
7. Taha H A.: Operations Research 6th edition, Prentice Hall of India.

8. Sharma J K, : Quantitative Techniques For Managerial Decisions, MacMillan India Ltd. (2001)
9. Kapoor V K. : Operation research technique for management 7th edition
10. Shankaran Sunder : Indian mutual funds handbook - A guide for industry professionals and intelligent investors
11. Hull John C: Options futures and other derivatives: –7th edition. Prentice hall
12. Hull John C : Fundamentals of futures of Options and Market : 6th edition
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	TOTAL	**60**	

Practical Examination Pattern:

A) Examination: 20%- 20 Marks

Particulars	Marks
Journal	5
Experimental tasks/Project/Assignments	15
Total	**20**

B) External Examination: 80%- 80 Marks

Semester End Practical Examination:
Duration - These examinations shall be of **THREE HOURS** duration.

Particulars	Paper
EXAM	**RUSACORP601**
Total	**80**

Overall Examination & Marks Distribution Pattern

Semester VI

Course	RUSACOR601		
	Internal	**External**	**Total**
Theory	**40**	**60**	**100**
Practicals	**20**	**80**	**100**
