

S. P. Mandali's
Ramnarain Ruia Autonomous College
(Affiliated to University of Mumbai)



Syllabus for
Program: T.Y.B.Sc.
Program Code For Semester 5:
Elements of Operations Research (RUSACOR)
(Credit Based Semester and Grading
System for academic year 2024–25)

GRADUATE ATTRIBUTES

GA	GA Description
	A student completing Bachelor's/Master's Degree in science program will be able to:
GA 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.
GA 2	Evaluate scientific ideas critically, analyse problems, explore options for practical demonstrations, illustrate work plans and execute them, organise data and draw inferences.
GA 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.
GA 4	Ask relevant questions, understand scientific relevance, hypothesize a scientific problem, construct and execute a project plan and analyse results.
GA 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.
GA 6	Apply scientific information with sensitivity to values of different cultural groups. Disseminate scientific knowledge effectively for upliftment of the society.
GA 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.
GA 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 OUTCOMES

PO	Description
	A student completing Bachelor's Degree in science program in the subject of Elements of Operations Research (AC) (Semester 5) / Data Analysis using Python(AC)(Semester 6) will be able to:
PO 1	Understand, condense, visualize, analyze and interpret various data types generated in various scenarios of scientific, industrial, or social problems.
PO 2	Apply Statistical tools for data analysis.
PO 3	Pursue their higher education programs leading to post-graduate and/or doctoral degrees in Statistics, Data Science, Business Analytics, Biostatistics, Econometrics, Management Studies.
PO 4	Compete globally to enter into promising careers.
PO 5	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.
PO 6	Seek employment or self-employment in different sectors like Stock trading, Pharmaceutical sector, Sports, Politics, Business, Financial services and Media Industry.

PROGRAM OUTLINE

YEAR	SEMESTER	COURSE CODE	COURSE TITLE	CREDITS
TYBSc	V	RUSACOR501	ELEMENTS OF OPERATIONS RESEARCH- I	2
TYBSc	V	RUSACORP501	PRACTICAL BASED ON RUACOR501	2

Course Code: RUSACOR501

Course Title: ELEMENTS OF OPERATIONS RESEARCH

Academic year 2024-25

COURSE OUTCOMES:

COURSE	DESCRIPTION
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OUTCOME	A student completing this course will be able to:
CO 1	Demonstrate a thorough understanding of the linear programming problem, including formulation, solution techniques, and interpretation of results and also sensitivity analysis.
CO 2	Understand the principles of information theory, including entropy, information content, and data compression and also apply information theory concepts to analyse and optimize communication systems.
CO 3	Analyse the structure and function of securities markets, including stocks, bonds, and commodities, and their impact on the global economy and evaluate the risks and rewards associated with different types of derivative securities such as futures, options.
CO 4	Gain proficiency in mathematical techniques used in finance, including time value of money, interest rates, and present value analysis and also explore the principles of mutual funds, including portfolio diversification, risk management, and investment strategies.

DETAILED SYLLABUS

Course Code/ Unit	Unit	Course/ Unit Title	Credits/ Lectures
RUSACOR501	Unit I	Overview of Linear Programming Problem, Sensitivity Analysis and Duality: <ul style="list-style-type: none"> • Overview of LPP: Formulation, Solution by graphical and Simplex Method • Introduction and Graphical method of Sensitivity • Sensitivity analysis using Simplex Method [With Proof] <ul style="list-style-type: none"> ➤ 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 • Solution of LPP for unrestricted variables using Two Phase Method • Concept of Duality. • Its use in solving L.P.P. Relationship between optimum solutions to Primal and Dual. • Dual Simplex Algorithm 	15 Lectures
RUSACOR501	Unit II	Information theory <ul style="list-style-type: none"> • Introduction. Fundamental Theorem of Information Theory. • Measures of Information. Properties of Entropy Function. • Communication System. Memory less channel, 	15 Lectures



		<p>Binary Symmetric channel, channel matrix, joint, marginal and conditional Entropies.</p> <ul style="list-style-type: none"> $H(X, Y) = H(X/Y) + H(Y) = H(Y/X) + H(X)$ $H(X) \geq H(X/Y)$ <p>Channel capacity, Efficiency and Redundancy, Encoding, Shannon–Fano Encoding Procedure.</p>	
RUSACOR501	Unit III	<p>Securities Market and Derivatives</p> <ul style="list-style-type: none"> • 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. <p>Options terminology:</p> <ul style="list-style-type: none"> • Index option, Stock option, American option, European option. • Strike price, Expiry date, Call option, Put option, Buyer of an option, Writer of an option. <p>Futures & Options:</p> <ul style="list-style-type: none"> • Introduction to F & O market. • Difference between Forward and Futures contracts. • Factors influencing the market. Hedging, Arbitrage, Open interest 	15 Lectures
RUSACOR501	Unit IV	<p>Mathematics of Finance, Mutual Funds</p> <ul style="list-style-type: none"> • Accumulated Value and Present Value of Single Payment and Series of Payments. • Application to investment decisions <ul style="list-style-type: none"> ➢ Payback Method ➢ Net present value Method (NPV), ➢ Internal Rate of Return Method <p>Mutual Funds (M.F)</p> <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> ➢ Systematic Investment Plan (SIP) ➢ Systematic Withdrawal Plan (SWP) ➢ Systematic Transfer Plan (STP) 	15 Lectures

DISTRIBUTION OF TOPICS FOR PRACTICAL

Course Code RUSACORP501	
Sr. No	Practical based on course
1	Graphical solution with sensitivity
2	Two Phase Method
3	Duality And Dual Simplex
4	Sensitivity Analysis using Simplex Method
5	Information Theory
6	Security Market
7	Derivatives
8	Investment Analysis and Mutual Funds

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	Any TWO subparts out of Three subparts	16	Unit I
2	Any TWO subparts out of Three subparts	14	Unit II
3	Any TWO subparts out of Three subparts	16	Unit III
4	Any TWO subparts out of Three subparts	14	Unit IV
	TOTAL	60	

Semester End Practical Examination Pattern:

Particulars	Marks
Journal	20
Practical	80
Total	100

External Examination: 80 Marks



There will be Two question with 4 parts each. Each part will be based on one unit for 20 marks. Student will attempt ANY ONE question.

Duration - These examinations shall be of **THREE HOURS** duration.

Overall Examination & Marks Distribution Pattern

Semester VI

Course	RUSACOR501		Total
	Internal	External	
Theory	40	60	100
Practical	--	100	100
