Resolution No.: AC/I(19-20).2.RUS17

S.P. Mandali's

RAMNARAIN RUIA AUTONOMOUS COLLEGE

Syllabus for: T.Y.B.Sc.

Program: B.Sc.

Course Code: Elements of Operations Research (RUSACOR)

(APPLIED COMPONENT)

(Choice Based Credit System (CBCS) with effect from academic year 2019-20)

APPLIED COMPONENT SYLLABUS
Elements of Operations Research

The learners will have one course per semester in Elements of Operations Research.

Learning Objectives

1. To introduce Operation Research techniques to learners.
2. To introduce learners to security markets and concepts of Futures and Options.
3. To introduce learners to information theory and network models.
4. To equip learners with the use of software to solve problems.

Learning Outcomes

At the end of the course the learner will be able to

1. Apply the optimizing techniques in Operations Research and solve problems using software.
2. Use knowledge of security markets for investments in day to day life.

SEMESTER V

Course	UNIT	TOPICS	Credits	L / Week
RUSACOR501	I	Linear programming problem (LPP), Graphical Sensitivity and Two Phase Method	2	1
	II	Duality, Dual Simplex and Sensitivity through Simplex Method		1
	III	Network Models		1
	IV	Transportation and Transshipment Problems		1

Course	PRACTICAL	Credits	L / Week
RUSACORP501	Practical based on RUACOR501	2	2

Course Code: ELEMENTS OF OPERATION RESEARCH (I)

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**
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**

Unit III:- Network Models:- • Objective and outline of CPM/PERT techniques. • Critical path computation. Slack and Three float times. • Probability consideration in project scheduling. Project cost analysis. • Minimal Spanning and Shortest Route method	**15 Lectures**
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**

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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

SEMESTER VI

Course	UNIT	TOPICS	Credits	L / Week
RUSACOR601	I	Game Theory and Decision Theory	2	1
	II	Information theory		1
	III	Mathematics of Finance, Mutual Funds		1
	IV	Securities Market, Futures & Options		1

Course	PRACTICAL	Credits	L / Week
RUSACORP601	Practical on RUSACOR601	2	2

Course Code: ELEMENTS OF OPERATION RESEARCH (II)

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**
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. $H(X,Y)= H(X/Y) + H(Y) =H(Y/X) + H(X)\ H(X) \geq H(X/Y)$ • Channel capacity, Efficiency and Redundancy, Encoding, Shannon–Fano Encoding Procedure.	**15 Lectures**

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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 (Ref 12) **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**
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:-** • Introduction to F & O market. • Difference between Forward and Futures contracts. • Factors influencing the market. • Hedging, Arbitrage, Open interest	**15 Lectures**

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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
13. Ingles Franklin M: Information and coding Theory : Intext Educational Publishers

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DISTRIBUTION OF TOPICS FOR PRACTICALS

	RUSACORP501		RUSACORP601
Sr. No	**Name of the Topic**	**Sr. No**	**Name of the Topic**
1	Formulation and Graphical solution with sensitivity	1	~~DUALITY AND DUAL SIMPLEX~~Game Theory
2	Two Phase Method	2	~~INTEGER PROGRAMMING~~ Decision Theory 1
3	~~PROBABILITY I~~ Duality And Dual Simplex	3	Decision Theory 2
4	Sensitivity Analysis	4	Information Theory
5	PERT CPM 1	5	Investment Analysis
6	PERT CPM 2	6	Mutual Funds
7	Transportation Problems	7	Market Analysis,
8	Transhipment Problem	8	Futures And Options

MODALITY OF ASSESSMENT

Theory Examination Pattern: Core Courses Per Semester Per Course

A) Internal Assessment - (40%): **40 marks.**

Internal Assessment of Theory Core Courses Per Semester Per Course

1. One Class Test (Objective type): ….. 20 Marks.
2. One Class Test (Objective type) / Project / Assignment / Presentation: …20 Marks.

B) External examination - (60 %) : 60 Marks

Semester End Theory Assessment – (60 marks)

i. Duration - These examinations shall be of **TWO hours** duration.

ii. Paper Pattern:

1. There shall be **Four** questions each of **15** marks, there will be one question on each unit.
2. All questions shall be compulsory with internal choice within the questions.

Questions	Options	Marks	Questions on
1	Compulsory Sub-question A and Sub-question B or C	15	Unit I
2	Compulsory Sub-question A and Sub-question B or C	15	Unit II
3	Compulsory Sub-question A and Sub-question B or C	15	Unit III
4	Compulsory Sub-question A and Sub-question B or C	15	Unit IV

Practical Examination Pattern (per Semester per course)

(A) Internal Examination: (40% Marks) 40 Marks

Heading	Practical
One Class Test	30
Journal	10
Total	40

(B) External (Semester end practical examination): (60 Marks)

Questions	Options	Marks	Questions on
1	Sub-question A or Sub-question B	15	Unit I
2	Sub-question A or Sub-question B	15	Unit II
3	Sub-question A or Sub-question B	15	Unit III
4	Sub-question A or Sub-question B	15	Unit IV

PRACTICAL BOOK/JOURNAL

The students are required to present a duly certified journal for appearing at the practical examination, failing which they will **not be allowed to appear for the examination.**

In case of loss of Journal and/or Report, a Lost Certificate should be obtained from Head/ Co-ordinator / In-charge of the department; failing which the student will not be allowed to appear for the practical examination.

Workload

Theory : 4 lectures per week .

Practicals: 2 practical each of 2 lecture periods per week per batch. Two lecture periods of the practical shall be conducted in succession together on a single day

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