



RAMNARAIN RUIA AUTONOMOUS COLLEGE
MATUNGA, MUMBAI

Syllabus for the T.Y.B.Sc.
Program: B.Sc.
Course: APPLIED COMPONENT
(Elements of Operations Research)

(Credit Based Semester and Grading System with
effect from the academic year 2018–2019)

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) and Sensitivity analysis	2	1
	II	Probability		1
	III	Network Models		1
	IV	Information theory		1

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

SEMESTER VI

Course	UNIT	TOPICS	Credits	L / Week
RUSACOR601	I	Duality and Integer programming problem (IPP)	2	1
	II	Decision Analysis		1
	III	Mathematics of Finance , Securities Market, Futures & Options		1
	IV	Simulation and Mutual Funds (M.F):-		1

Course	PRACTICAL	Credits	L / Week
RUSACORP601	Practicals of Course above	2	2

Course Code: RUSACOR501: ELEMENTS OF OPERATIONS RESEARCH-I

<p>Unit I : Linear programming problem (LPP) and Sensitivity analysis:-</p> <ul style="list-style-type: none"> • Introduction, formation of LPP, solution of LPP using <ul style="list-style-type: none"> ➤ Graphical method ➤ Simplex Method (with and without artificial variable) ➤ Solution of LPP for unrestricted variables • Sensitivity analysis:-[With Proof] <ul style="list-style-type: none"> ➤ Variation in the price vector “c”. ➤ Variation in requirement vector “b”. ➤ Addition of a new variable to the LPP. <p style="text-align: right;">(Ref 1,2,3,4,6,7)</p>	<p>15 Lectures</p>
<p>Unit II:- Probability:-</p> <ul style="list-style-type: none"> • Random experiment, sample space, event, addition law of probability, conditional law of probability. Random variables: Discrete, Continuous. • Mean and Variance of : 1) Uniform Distribution, 2) Binomial Distribution, 3) Poisson Distribution, 4) Exponential Distribution, 5) Normal Distribution • Simple problems based on above distributions. <p style="text-align: right;">(Ref:5,10)</p>	<p>15 Lectures</p>
<p>Unit III:- Network Models:-</p> <ul style="list-style-type: none"> • Objective and outline of CPM/PERT techniques. • Critical path computation. Slack and Three float times. • Probability consideration in project scheduling. Project cost analysis. <p style="text-align: right;">(Ref 9)</p>	<p>15 Lectures</p>
<p>Unit IV:- Information theory:-</p> <ul style="list-style-type: none"> • 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. $H(X,Y)= H(X/Y) + H(Y) =H(Y/X) + H(X) \quad H(X) \geq H(X/Y)$ • Channel capacity, Efficiency and Redundancy, Encoding, Shannon–Fano Encoding Procedure. <p style="text-align: right;">(Ref 3)</p>	<p>15 Lectures</p>

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. Blake Ian F .: Theory of Probability:
11. Ingels Franklin M: Information and coding Theory : Intext Educational publishers

Course Code: RUSACOR601: ELEMENTS OF OPERATION RESEARCH (II)

<p>Unit I : Duality and Integer programming problem (IPP):-</p> <ul style="list-style-type: none"> • Concept of Duality. • Concept of Dual Simplex, • Solution of LPP using Dual Simplex Algorithm. • Integer programming problem (IPP):- Introduction, solution of IPP using Graphical method, Gomory's Method. <p style="text-align: right;">(Ref: 7,13,14)</p>	<p>15 Lectures</p>
<p>Unit II:- Decision Analysis:-</p> <ul style="list-style-type: none"> • Decision environments. Decision making under certainty. • Decision making under risk. Expected value criterion. Decision tree analysis. • Decision making under uncertainty using <ul style="list-style-type: none"> ➤ The Laplace criterion ➤ The Minimax (Maximin) criterion ➤ The savage minimax regret criterion ➤ The Hurwitz criterion <p style="text-align: right;">(Ref : 5,8)</p>	<p>15 Lectures</p>
<p>Unit III:- Mathematics of Finance , Securities Market, Futures & Options:-</p> <ul style="list-style-type: none"> • Simple and compound interest, Annuities. • Application to investment decisions <ul style="list-style-type: none"> ➤ Payback Method ➤ Net present value Method (NPV), ➤ Internal Rate of Return Method <p style="text-align: right;">(Ref 12)</p> <p>Securities Market:-</p> <ul style="list-style-type: none"> • 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 earning ratio (PE). Index, nifty, beta value. 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 <p style="text-align: right;">(Ref 10 ,11)</p>	<p>15 Lectures</p>
<p>Unit IV:- Simulation and Mutual Funds (M.F):-</p> <ul style="list-style-type: none"> • Scope of simulation application. Monte Carlo technique. • Generation of random numbers using <ul style="list-style-type: none"> ➤ Mid-square Method ➤ Multiplicative Congruential method • Sampling from probability distribution by inverse method for 	<p>15 Lectures</p>

<ul style="list-style-type: none"> ➤ Uniform distribution ➤ Exponential distribution. (Ref:1) <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 <ul style="list-style-type: none"> ➤ Averaging of price under the systematic Investment Plan (SIP) ➤ Systematic Withdrawal Plan (SWP) ➤ Systematic Transfer Plan (STP) (Ref 9) 	
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REFERENCES

1. Kantiswaroop and Manmohan Gupta.:Operations Research 4th Edition; S Chand & Sons.
2. Richard Broson.: Schaum Series book in O.R 2nd edition Tata Mcgraw Hill Publishing Company Ltd.
3. Sasieni Maurice Arthur Yasan and Lawrence Friedman: Operations Research: Methods and Problems John Wiley & Sons.
4. Sharma J K, (1989).: Mathematical Models in Operations Research ,Tata McGraw Hill Publishing Company Ltd.
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, KedarNath Ram Nath & Company.
7. Taha H A.: Operations Research 6th edition, Prentice Hall of India.
8. Sharma J K, : Quantitative Techniques For Managerial Decisions: , (2001), MacMillan India Ltd.
9. Shankaran Sunder : Indian mutual funds handbook - A guide for industry professionals and intelligent investors by
10. Hull John C: Options futures, and other derivatives: -7th edition. Prentice hall
11. Hull John C :Fundamentals of futures of Options and Marke Operation Research : t : 6th edition
12. Kapoor V K. :Operation research technique for management 7th edition
13. Gupta R K. :Linear Programming , 2nd Edition
14. Gupta M P and Sharma J K.: Linear programming for management : 1st edition national publishing house
15. Hogg R V& Tanis E A: Probability and Statistical inference: 3rd edition. Collier and McMillan Publishers
16. Blake Ian F .: Theory of Probability:
17. Ingels Franklin M: Information and coding Theory : Intext Educational Publishers

DISTRIBUTION OF TOPICS FOR PRACTICALS

<u>SEMESTER-V</u> <u>RUSACORP501</u>		<u>SEMESTER-VI</u> <u>RUSACORP601</u>	
Sr. No	Name of the Topic	Sr. No	Name of the Topic
1	L.P.P	1	DUALITY AND DUAL SIMPLEX
2	SENSITIVITY ANALYSIS	2	INTEGER PROGRAMMING
3	PROBABILITY I	3	DECISION THEORY
4	PROBABILITY II	4	SIMULATION
5	PERT CPM I	5	INVESTMENT ANALYSIS
6	PERT CPM II	6	MARKET ANALYSIS
7	INFORMATION THEORY	7	MUTUAL FUNDS

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.

Semester End Examination- Theory

At the end of the semester, examination of two hours duration and 60 marks based on the four units shall be held for each course.

Pattern of **Theory question** paper at the end of the semester for **each course**:

There shall be **Four** compulsory Questions of **Fifteen** marks each with internal option. Question 1 based on Unit I, Question 2 based on Unit II, Question 3 based on Unit III, Question 4 based on Unit IV.

Practicals: Total evaluation is of **100** marks for the semester:

- 1. Journal.... ... **10Marks.**
- 2 Assignments using R software/ TORA software **10 Marks**
- 3 At the end of the semester, examination of 3 hours duration **80marks.**

Pattern of **Practical question** paper at the end of the semester

There shall be **FOUR** compulsory questions of **TWENTY** marks each with internal option.

Workload

Theory : 4 lectures per week .

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