

**AC 27/2/13**  
**Item No. 4.15**

**UNIVERSITY OF MUMBAI**



**Syllabus for Semester V and VI**  
**Program: B.Sc.**  
**Course: Elements of Operations**  
**Research**  
**APPLIED COMPONENT**

(Credit Based Semester and Grading System with  
effect from the academic year 2013–2014)

**APPLIED COMPONENT**  
**Elements of Operations Research**  
**Credit Based semester and Grading System**  
**To be implemented from the Academic year 2013-2014**  
**SEMESTER V**

Course Code USACOR501	ELEMENTS OF OPERATION RESEARCH (I)	Credits 2
UNIT-I	<p><b>Linear programming problem (LPP) and Sensitivity analysis:-</b>            Introduction, formation of LPP, solution of LPP using            1) Graphical method            2) Simplex Method (with and without artificial variable)            3) Solution of LPP for unrestricted variables            Sensitivity analysis:-[WITHOUT PROOF]            1) Variation in the price vector “c”.            2) Variation in requirement vector “b”.            3) Addition of a new variable to the LPP.            .            (Ref 1,2,3,4,6,7)</p>	15 L
UNIT -II	<p><b>Probability:-</b>            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.            (Ref:16,17)</p>	15 L
UNIT –III	<p><b>Network Models:-</b>            Objective and outline of CPM/PERT techniques. Critical path computation. Slack and Three float times. Probability consideration in project scheduling. Project cost analysis.            (Ref 15 )</p>	15L
UNIT –IV	<p><b>Information theory:-</b>            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.  <math>H(X,Y) = H(X/Y) + H(Y) = H(Y/X) + H(X)</math>  <math>H(X) \geq H(X/Y)</math>            Channel capacity, Efficiency and Redundancy, Encoding, Shannon – Fano Encoding Procedure. .            ( Ref 18)</p>	15L

Course Code USACOR5P1	Practicals based on theory	2 Credits
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**SEMESTER VI**

Course code USACOR601	ELEMENTS OF OPERATIONS RESEARCH (II)	2 Credits
UNIT -I	<p><b>.Duality and Integer programming problem (IPP):-</b>            Concept of Duality.            Concept of Dual Simplex, Solution of LPP using Dual Simplex Algorithm.            Integer programming problem (IPP):-            Introduction, solution of IPP using            1)Graphical method            2)Gomory's Method.</p> <p align="right">(Ref: 7,13,14)</p>	15 L
UNIT-II	<p><b>Decision Analysis:-</b>            Decision environments. Decision making under certainty. Decision making under risk. Expected value criterion. Decision tree analysis. Decision making under uncertainty            The Laplace criterion            The Minimax (Maximin) criterion            The savage minimax regret criterion            The Hurwicz criterion</p> <p align="right">(Ref : 5,8)</p>	15L
UNIT -III	<p><b>Mathematics of Finance , Securities Market, Futures &amp; Options:-</b>            Simple and compound interest, Annuities. Application to investment decisions 1) Payback Method 2) Net present value Method (NPV), 3) Internal Rate of Return Method.</p> <p align="right">(Ref 12)</p> <p>Securities Market:-            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.            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 &amp; Options:-            Introduction to F &amp; O market. Difference between Forward and Futures contracts. Factors influencing the market.            Hedging, Arbitrage, Open interest</p> <p align="right">(Ref 10 ,11)</p>	15L
UNIT -IV	<p><b>Simulation and Mutual Funds (M.F):-</b>            Scope of simulation application. Monte Carlo technique. Generation of random numbers using 1) Mid-square 2)Multiplicative Congruential</p>	15L

	<p>method Sampling from probability distribution by inverse method for 1)Uniform distribution, 2) Exponential distribution. ( Ref:1)</p> <p>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 1) Averaging of price under the systematic Investment Plan (SIP) 2)Systematic Withdrawal Plan (SWP) 3) Systematic Transfer Plan (STP) (Ref 9)</p>	
<b>Course Code USACOR 6P2</b>	<b>Practicals based on theory</b>	<b>2 Credits</b>

**DISTRIBUTION OF TOPICS FOR PRACTICALS**

	<b><u>SEMESTER-V</u></b> <b><u>COURSE CODE USACOR5P1</u></b>		<b><u>SEMESTER-VI</u></b> <b><u>COURSE CODE USACOR6P1</u></b>
<b>Sr. No</b>	<b>Name of the Topic</b>	<b>Sr. No</b>	<b>Name of the Topic</b>
1	L.P.P I	1	DUALITY AND DUAL SIMPLEX
2	L.P.P II	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 Assignments: ..... **10 Marks.**
- 2. One Class Test: ..... **20 Marks..**
- 3. Active participation in class instructional deliveries:.....**05 Marks..**
- 4. Overall conduct as a responsible student, mannerism etc :.... **.05 Marks.**

**Semester End Examination**

**Theory:** At the end of the semester, examination of **two and half 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 **Five** compulsory Questions of **12** marks each with internal option .  
Question1 based on Unit I, Question 2 based on Unit II, Question 3 based on Unit III,  
Question 4 based on Unit IV and Question 5 based on all four Units combined.

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

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

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 periods per week per batch. Two periods of the practicals shall be conducted in succession together on a single day

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**REFERENCES**

- 1. Kantiswaroop and Manmohan Gupta.: Operations Research 4<sup>th</sup> Edition; S Chand & Sons.
- 2. Richard Broson. : Schaum Series book in O.R 2<sup>nd</sup> edition Tata Mcgraw Hill Publishing Company Ltd.
- 3. Sasieni Maurice Arthur Yaspan 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 2<sup>nd</sup> Edition, Prentice Hall of India Ltd.
6. Sharma S D. : Operations Research 11<sup>th</sup> edition, Kedar Nath Ram Nath & Company.
7. Taha H A.: Operations Research 6<sup>th</sup> 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 : -7<sup>th</sup> edition. Prentice Hall
11. Hull John C : Fundamentals of futures of Options and Marke Operation Research :t : 6<sup>th</sup> edition
12. Kapoor V K. : Operation research technique for management 7<sup>th</sup> edition
13. Gupta R K. :Linear Programming , 2<sup>nd</sup> Edition
  
14. Gupta M P and Sharma J K.: Linear programming for management : 1<sup>st</sup> edition national publishing house
15. Shrinath L S : Principles and application: Pert and CPM. : Affiliated East West press pvt ltd
16. Hogg R V& Tanis E A: Probability and Statistical inference: 3<sup>rd</sup> edition. Collier and McMillan Publishers
17. Blake Ian F .: Theory of Probability:
18. Ingels Franklin M : Information and coding Theory : Intext Educational Publishers

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