Course Structure For Operational Research

in

B.A. Programme

		Duration hours	Maximum Marks
1.	Linear Programming	3	100
2.	Inventory and Marketing Management	3	100
3.	Mathematical Programming	3	100
4.	Queueing and Reliability Theory	3	100
5.	Network Analysis and Theory of Sequencing	3	100
6.	(a) Forecasting	3	50
	(b) Case Studies		50

Note : Each paper will have four lecture periods.

1. Linear Programming

Introduction to Operational Research and Overview of O.R. modeling. Linear independence and dependence. Convex sets. Extreme points. Hyperplanes & Polyhedral sets. Solution of a System of Linear Equations, Concept of Basis, Basic Feasible Solutions.

Introduction to Linear Programming problem. Problem formulations. Graphical Solution. Theory of Simplex Method. Two Phase Simplex Method. M-Charne's Simplex Method. Duality in Linear Programming, Economic Interpretation of Duality. Transportation problem. Assignment Problem.

Suggested Readings:

1. G. Hadley: Linear Programming, Narosa, 1987 (2002 reprint available).
2. Hamdy A. Taha: Operations Research-An Introduction, Prentice Hall, 8th Edition, 2007.
3. F.S. Hillier, G.J. Lieberman : Introduction to Operations Research- Concepts and Cases, 9th Edition, Tata McGraw Hill, 2010.

2. **Inventory Systems and Marketing Management**

Inventory Systems:

Concepts and problems in Inventory system, Classification of Inventory systems, Different costs in Inventory system and method of their estimation. Detreministic inventory models with and without lead time and with and without shortages. Inventory models with all units Quality Discounts. Single period stochastic inventory models. Production scheduling problems.

Marketing Management:

Concept of marketing and its role in organization. Marketing decisions, scientific marketing analysis. Uses and limitations of mathematical models in marketing, Classification of market structure in competitive conditions. Demand elasticity, joint optimization of price, quality and promotional efforts. Pricing decisions. Media allocation for advertisement. Brand switching analysis.

Suggested Readings:

1. G. Hadley, T. M. Whitin: Analysis of Inventory Systems, D. B. Taraporevala and Sons, Published by arrangement with Prentice Hall Inc., 1979.

2. Zipkin: Foundations of Inventory Management, Mc-Graw Hill Inc., 2000.

3. Donald Waters: Inventory Control, John Wiley, 2003.

~4. Philip Kotler : Marketing Management, 13th edition, Prentice Hall of India, 2008.

5. Tony Curtis: Marketing for Engineers, Scientists and Technologists, John Wiley & Sons Inc. 2008.

6. Graham J. Hooley and Michael K. Hassey: Quantitative Methods in Marketing, 2nd Edition, International Thomson Business Press, 1999.

7. Grahame R. Dowling: The Art and Science of Marketing- Marketing for Marketing Managers, Oxford University Press, 2005.

8. Gary L. Lilien, Philip Kotler, K. Sridhar Moorthy: Marketing Models, Prentice Hall of India, 2003.

3. Mathematical Programming

Unconstrained and constrained optimization problems. Types of extrema and their necessary and sufficient conditions. Convex functions and their properties. Kuhn-Tucker optimality conditions. Quadratic Programming. Wolfe's Method. Integer Linear Programming: Modeling using pure and mixed integer programming, Branch and Bound Technique, Gomory's Cutting Plane Algorithm.

Suggested Readings:
1. Hamdy A. Taha: Operations Research-An Introduction, Prentice Hall, 8th Edition, 2007.
2. Wayne L. Winston and M. Venkataramanan: Introduction to Mathematical Programming: Applications and Algorithms, 4th edition, Duxbury Press, 2002.
3. S. Chandra, Jayadeva, Aparna Mehra: Numerical Optimization with Applications, Narosa Publishing House, 2009.
4. A. Ravindran, D. T. Phillips and James J. Solberg: Operations Research-Principles and Practice, John Wiley & Sons, 2005.

4. Queueing and Reliability Theory

Queueing Theory:

General concepts of a queuing system, Measures of performance, Arrival and Service Processes, Single server and multi server models, channels in parallel with limited and unlimited queues – M/M/1, M/M/1/K, M/M/C, M/M/C/K, Queues with unlimited service, Finite source queues. Applications of simple queuing decision models, Design and control models.

Reliability Theory :

Basics of Reliability. Classes of life distributions. Series, parallel, standby configurations. Reliability Models. Reliability, Mean Time before failure and Hazard rate of Exponential and Weibull distributions. Concepts and definitions of

... .nance, corrective maintenance and age replacement.

Suggested Readings:

1. R.B. Cooper: Introduction to Queueing Theory, 2nd Edition, North Holland, 1981.

2. D. Gross, C. M.Harris: Fundamentals of Queueing Theory, 3rd Edition, John Wiley and Sons Inc. Pte. Ltd., 2002.

3. U. N. Bhat: An introduction to Queueing Theory: Modelling and Analysis in Applications (Statistics for Industry and Technology), Birkhauser Boston, 2008.

4. U. N. Prabhu: Foundations of Queueing Theory, International Series in Operations Research & Management Science, Kluwer Academic Publishers, 2nd Edition, 2002.

5. John G. Rau: Optimization and Probability in Systems Engineering, V.N. Reinhold Co., 1970.

6. Riccardo Manzini, Alberto Regattieri, Hoang Pham, Emilio Ferrai : Maintenance for Industrial Systems, Springer-Verlag, London Limited, 2010.

7. P. K. Kapur, R. B. Garg, S. Kumar: Contributions to Hardware and Software Reliability, World Scientific, Singapore, 1999.

5. Network Analysis and Theory of Sequencing

Flows in networks. Maximal flow. Shortest path and traveling salesman problem. Construction of minimal spanning tree and its applications. Project management through PERT/ CPM, Updating of PERT Charts. Project Crashing. Sequencing Problems. Processing n jobs through two/ three machines. General n/m job-shop problem.

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6 ★ **(a) Forecasting**

Introduction to Forecasting, Types of Forecast, Basic forecasting tools. Time Series and its Components. Linear and Non-linear Trend, Seasonal Variations and Irregular Variations and their Measurements. Moving Averages. Single and Double exponential smoothing.

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3. S.C. Gupta and V.K.Kapoor, Fundamentals of Applied Statistics, Sultan. Chand and Sons, 2009.

(b) Case Studies

The work on Case Study will start in the beginning of the sixth semester under approved supervisors from amongst the members of the staff and the case study report is to be submitted for evaluation at the end of the semester.

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in

B.Sc. Applied Physical Sciences

		Duration hours	Maximum Marks
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