FACULTY OF COMPUTER APPLICATIONS
Bachelor of Science (Data Science)
B.Sc. (DS)

- **Sem.** : 4
- **Subject Code** : 05DS0404
- **Subject** : Operations Research
- **Course Objectives** :

1. To find out use of Operation Research techniques of strategic decision planning for optimum utilization of constraint resources in various span of human life.
2. To formulate & solve the linear programming model of real-life problem.
3. To determine optimal sequence of real-life sequencing problems.
4. To demonstrate the algorithmic approach rather than on theoretical side.
5. To analyze & solve inventory & replacement related problems.

- **Prerequisites**: Basic Knowledge of Mathematics

Unit No	Topics Covered	No of lectures required
1	**Basics of Operations Research, Transportation Problem:** • Operations Research Introduction • Definitions of Operations Research • Features of O.R. • Advantages & Disadvantages of O.R. • Applications of O.R. • Mathematical Definition of Transportation Problem • Formulation of T.P. • Methods to find Initial Basic Feasible Solution North West Corner Rule	12

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	Least Cost Cell Entry Method Vogel's Approximation Method	
2	**Assignment Problem, Theory of Games:** • Mathematical Definition of an Assignment Problem • Formulation of an Assignment Problem • Method to find an optimum solution - Hungarian Assignment Method • Variations of assignment problem • Theory of Games Introduction • Two-Person Zero Sum game • Pure strategies (Minimax & Maximin principles) Games with Saddle Point • Rules to determine Saddle Point	**12**
3	**Project Management and Scheduling:** • Introduction to PERT & CPM • Network concepts & components • Rules for network construction, • Critical Path Method (CPM) • Project evaluation and Review Techniques (PERT) • Introduction to Job Scheduling • Rules of Job Scheduling • Johnson's algorithm for N jobs on 2 machines • Johnson's algorithm for N jobs on 3 machines • Johnson's algorithm for N jobs on M machines	**12**
4	**Management of Inventory and Replacement:** • Introduction of the Inventory management • Terminologies used in Inventory management • Problem including Objective(s) and Constraints • Single Item Inventory Control without Shortages Model –I: EOQ model with constant rate of demand • Replacement Introduction • Definition of Replacement • Replacement of items that deteriorates • Replacement of items that fails completely	**12**
5	**Linear Programming Problem (L.P.P.):** • Linear Programming Problem (L.P.P.), Formulation of a L.P.P. • Mathematical definition of an L.P.P. with its components: objective function and constraints • Slack, Surplus and Artificial variables	**12**

	• Optimal solution using Graphical method • Optimal solution using Simplex method • Primal & Dual problem	

Course Outcomes: (After completion of this course student should be able to)

1. The central objective of operations research is optimization, i.e., "to do things best under the given circumstances."
2. The course is intended to provide basic understanding of Operation Research Techniques of strategic decision planning for optimum utilization of constraint resources in various span of human life.
3. The students will learn purpose, importance and applications of optimization techniques of Operation Research and will be able to design and construct suitable optimization models to solve real life strategic problems – issues.
4. Students will understand how to apply algorithm approach for inventory & replacement problems.
5. Able to convert real life problem into simulation & find optimal solution for the same.

Course Outcomes – Program Outcomes Mapping Table:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	L							
CO2	H	H						
CO3	H	H		L				L
CO4	H			M				M
CO5	H			H			M	H

Text Book:

1. **Operations Research – Theory and Application, J. K. Sharma, Macmillan Publishers India Ltd, Fourth Edition**

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Reference Books:

1. **Operations Research – Problems & Solutions, V. K. Kapur, Sultan Chand & Sons, First Edition**
2. **Operations Research, Verma A.P., S. K. Kataria & Sons, First Edition**
3. **Operations Research, Shah Nita H., Gor Ravi M., Soni Hardik, PHI Learning Pvt. Ltd., First Edition**

Web References:

1. **https://stemez.com/subjects/science/1HOperationsReseach/1HOperationsReseach.php**
2. **https://mathworld.wolfram.com/OperationsResearch.html**

App References:

1. **https://play.google.com/store/apps/details?id=com.swastik.operationalresearch**
2. **https://play.google.com/store/apps/details?id=com.HarderBooks.OperationResearchBookFree**

Syllabus Coverage from text book:

Unit #	Text Book #	Chapter Numbers
1	1	1(1.1 to 1.5, 1.10,1.13), 9 (9.1 to 9.5)
2	1	10 (10.1 to 10.4), 12 (12.1 to 12.3), 16(16.1 to 16.6)
3	1	13(13.1 to 13.6), 20(20.1 to 20.5)
4	1	14(14.1 to 14.5), 17(17.1 to 17.4)
5	1	2 (2.1 to 2.4, 2.6 to 2.8), 3(3.1 to 3.3.3, 3.4), 4 (4.1 to 4.6), 5 (5.1, 5.2)

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