KU6DSEMAT302: OPERATIONS RESEARCH

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
VI	DSE	300-399	KU6DSEMAT302	4	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4		1	30	70	100	2

Course Description

This course covers the fundamentals of Operations Research including the historical background, mathematical formulation of LPP, graphical solution method, simplex method, transportation Problem, assignment problem and sequencing problems.

Course Prerequisite

Basic understanding of linear algebra, calculus and probability.

Course Outcomes

CO No.	Expected Outcome	Learning Domains
1	Understand convex sets, convex functions, their properties	Understand
2	Formulate and solve LPP using graphical method and simplex algorithm	Apply
3	LP formulation of transportation problem and its solution	Apply
4	Mathematical formulation of Assignment problem and Hungarian Assignment method	Apply
5	Apply the problem of sequencing in Processing ‘n’ jobs through ‘2’machines, Processing ‘n’ jobs through ‘k’ machines and Processing ‘2’ jobs through ‘k’ machines	Apply

Mapping of Course Outcomes to PSOs							
	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	✓						
CO 2	✓		✓				
CO 3	✓		✓				
CO 4	✓		✓				
CO 5	✓		✓				

COURSE CONTENTS

Contents for Classroom Transaction

MODULE	UNIT	DESCRIPTION	HOURS
I		**LINEAR PROGRAMMING PROBLEM**	14
	1	(a) Convex sets and their properties	
		(b) Convex Functions	
		(c) Local and Global Extrema	
		(d) Quadratic forms	
	2	(a) Linear Programming Problem – Mathematical formulation	
		(b) Graphical solution method	
		(c) Some exceptional cases	
		(d) General Linear Programming Problem	
		(e) General Linear Programming Problem , Slack and Surplus Variables, standard form of LPP, Insights into the simplex method	

II	**SIMPLEX METHOD**		**14**
	1	(a) Basic Solution, Degenerate Solution, Basic Feasible Solution, Associated cost vector, Improved basic Feasible solution, Optimum Basic Feasible Solution.	
		(b) Fundamental Properties of solutions, Simplex method – The computational Procedure, The Simplex Algorithm.	
		(c) General Primal-Dual Pair, Formulating a dual problem	
III	**TRANSPORTATION PROBLEM**		**13**
	1	(a) LP formulation of the Transportation Problem	
		(b) Existence of solution in T.P, Duality in Transportation problem	
		(c) The Transportation Table, Loops in Transportation Tables, Triangular basis in a T.P	
		(d) Solution of a Transportation problem, North-west corner Method, Least –Cost Method, VAM	
		(e) Test For Optimality, Degeneracy in TP, MODI Method.	
IV	**ASSIGNMENT PROBLEM AND SEQUENCING PROBLEM**		**14**
	1	(a) Mathematical Formulation of Assignment Problem	
		(b) Hungarian Assignment Method.	
	2	(a) Problem of sequencing, Basic terms used in sequencing	
		(b) Processing ‘n’ jobs through ‘2’ machines	
		(c) Processing ‘n’ jobs through ‘k’ machines	
		(d) Processing ‘2’ jobs through ‘k’ machines	
V	**Teacher Specific Module**		**5**
	Directions		
	Operations research – an overview		
	Dual Simplex method		
	Maintenance Crew Scheduling.		

Essential Readings

1. K. Swarup, P.K.Gupta and M. Mohan, Operations Research (18th edition), Sulthan Chand and Sons.

Reference Distribution

Module	Unit	Reference No.	Sections	Remarks
I	1	1	Sections 0:13, 0:15. 0:16, 0:17	*Proof of theorems 0.4, 0.9 & 0.10 omitted*
	2	1	Sections 2:1, 2:2, 2:3, 2:4 and Sections 3:1, 3:2, 3:3, 3:4, 3:5, 3:6	*Canonical form omitted*
II	1	1	Sections 4:1, 4:2, 4:3, 5:1, 5:2, 5:3	*Proof of all theorems omitted*
III	1	1	Sections 10:1,10:2,10:3,10:4,10:5,10:6,10:7, 10:8,10:9,10:10,10:12,10:13	*Proof of theorems omitted*
IV	1	1	Sections 11:1, 11:2, 11:3	
	2	1	Sections 12:1, 12:2, 12:3, 12:4, 12:5, 12.6	
IV	1	1	Sections 17:1, 17:2, 17:3, 17:4, 17:5, 17:6, 17:7	*Proof of theorems omitted*

Suggested Readings

1. J.K. Sharma, Operations Research - Theory and Applications, McMillan
2. H.A. Thaha, Operations Research, An Introduction (8th edition), Prentice Hall
3. G. Hadley, Linear Programming, Oxford & IBH Publishing Company.

Assessment Rubrics

Evaluation Type		Marks
End Semester Evaluation		**70**
Continuous Evaluation		**30**
a)	Test Paper *	12
b)	Assignment	12
c)	Seminar, Viva-Voce	6
Total		**100**

* A student has to appear for at least two written tests. Average mark of best two tests is to be considered for internal mark.

** **Use of Scientific Calculators below 100 functions (that is, upto *fx 99*) shall be permitted.**