GUJARAT TECHNOLOGICAL UNIVERSITY

BRANCH NAME: INDUSTRIAL ENGINEERING (15)
SUBJECT NAME: RESOURCE OPTIMIZATION TECHNIQUES
SUBJECT CODE: 2171503
B.E. 7th SEMESTER

Type of course: Core

Prerequisite: No specific pre-requisite. Students should have primary understanding of production management concepts and necessary quantitative background.

Rationale: Operations Research studies analysis and planning of complex systems. This course will focus on mathematical modelling. A strong emphasis will be given to model formulation. On the methodology side, Linear Programming techniques, Transportation and assignment problems, queuing and replacement theory will be introduced.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	4	0	8	70	20	10	20	10	20	150

Content:

Sr. No.	Content	Total Hrs	% Weight age
1	Introduction: The origin, development, nature, definitions, and history of operations research. Scope and phases of O.R methods. Problem formulation model construction, deriving solutions from models.	2	4
2	Assignment Problems: Assignment problems, Methodical statement, important theorems, Hungarian method, Unbalanced and maximization problems. Travelling salesman problems.	6	8
3	Linear Programming : (a) General linear programming problems, mathematical formulation graphical method for the solution of L.P.P. simplex method, slack and surplus variables, degeneracy, duality in L.P.P., sensitivity analysis, and integer programming.	16	25
4	Transportation problems: Vogel's approximate methods, optimality test, Modi method, steppingstone method, degeneracy, unbalanced transportation problems, transshipment problems.	12	20
5	Queuing theory: Introduction, random arrivals to queue and exponential service times, simulation of queues (only application of problems).	8	13

6	Replacement theory: Introduction, replacement by alternative equipment, money value changing with time type replacement problems, group replacement policy, staffing problems.	8	12
7	Sequencing problems: Introduction, sequencing problems on n-jobs on two machines, n-jobs on three machines and n-jobs on m-machines. Graphical method of 2-jobs on m-machines problems.	4	6
8	Game theory: Introduction, Two-persons-zero-sum games, pay of matrix, strategy, saddle point, algebraic method, method of sub games for game theory problems.	8	12

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
30	35	15	10	5	5

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Operations Research: By J K Sharma, MacMillan Business books
2. Operations Research by V.K. Kapoor
3. Operations Research by Hamdy H. Taha
4. Fundamentals of operation Research by Russell L. Ackoff and Maurice W. Sasieni.
5. Operations Research (Methods and problems) by Sasieni M., L. Friedman.
6. Operation Management by Elword S. Buffa.
7. Operation Research by R.C.Gupta.

Course Outcome:

After learning the course the students should be able to:

Build their own formulations, to expand existing formulations, to critically evaluate the impact of model assumptions and to choose an appropriate solution technique for a given formulation.

List of Experiments:

The T.W. will be based on the above syllabus.

Design based Problems (DP)/Open Ended Problem: None

Major Equipment: None

List of Open Source Software/learning website: www. nptel.ac.in

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.