BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI

FIRST SEMESTER 2015-16

Course Handout

Date: 3/08/2015

Course No	:	**CE F411**
Course Title	:	**Operation Research for Engineers**
Instructor-in-charge	:	**RAJIV GUPTA**

Objective and Scope of the course

Churchman, Aackoff and Aruoff defined Operations Research as: *the application of scientific methods, techniques and tools to operation of a system with optimum solutions to the problems* where *optimum* refers to the best possible alternative. The objective of Operations Research is *to provide a scientific basis to the decision-makers for solving problems involving interaction of various components of the organization. You can achieve this by employing a team of scientists from different disciplines, to work together for finding the best possible solution in the interest of the organization as a whole.* The solution thus obtained is known as an optimal decision.

Operations Research Management focuses on the mathematical scoring of consequences of a decision aiming to optimize the use of time, effort and resources, and avoid blunders. The act of obtaining the best results under any given circumstances is known as optimizing. The key purpose of Operations Research (OR) is to do preparative calculations that aid the decision-making process..

Text Book:

T1: Hamdy A. Taha, Operations Research, Pearson, 2012 .

Reference Books:

R1: Kalyanmoy Deb Multiobjective optimization using Evolutionary Algorithms, John Wiley and Sons, Ltd, 2002

R2: M.P. Gupta, and R.B. Khanna, Quantitative Techniques for Decision Making Prentice-Hall of India, New Delhi, 2004

R3: Gupta, R. Construction Planning and Technology, CBS Publishers, 2012

Course Plan

Lect. No.	Learning Objective	Topics to be covered	Reference
1-2	Introduction	Overview, applications and major components of operation Research	T1
3-6	Linear Programming	Introduction, Formulation of linear programming problems, graphical method of solving LP problem,	T1
7-9	Simplex Method	maximization and minimization, Degeneracy in LPP, Unbounded and, Infeasible solutions	T1
10-12	Duality and Sensitivity Analysis	Definition, Relationship between primal and dual solutions, Economic Interpretation, Post optimal of sensitivity analysis, Dual Simplex Method.	T1
13-17	Integer Linear Programming	Branch and Bound Algorithm and Cutting Plane algorithm, applications	T1
18-22	Non linear Programming	Unconstrained and Constrained algorithms, applications	T1
23-27	Transportation models and its variants	Finding an initial feasible solution - North West corner method, Least cost method, Vogel's Approximation method, Finding the optimal solution, optimal solution by stepping stone and MODI methods, Special cases in Transportation problems - Unbalanced Transportation problem.	T1
28-32	Multi-objective Optimization (MOOP)	Linear, nonlinear, convex and Nonconvex, Pareto - optimal , non conflicting objectives	R1
33-35	Evolutionary Computation	Genetic algorithm, Evolution strategies, Multi modal function optimization	R1
36-39	Inventory Models	Basic concepts, Quantity, positive lead time, Backorders, quantity discounts, lot size models, etc	T1
40-43	Queuing Theory	Introduction, single channel - poission arrivals - exponential service times with infinite population & finite population, Multi channel - poisson arrivals - Exponential service times with infinite population	T1
44-47	Decision Making under certainty, risk and uncertainty	Introduction, steps in decision making, environment, Decision Making under uncertainty, Decision Making under risk, Decision trees	R2

Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Venue	Remarks
Mid-semester	90 min.	30	10/10 2:00 - 3:30 PM	TBA	CB
Tutorials	30mx8	15		6107	
Project	1Mx2	10			
Comprehensive	180min.	35	14/12 FN	TBA	OB

Chamber Consultation Hour: To be announced in the class.

Notices: Notices if any, concerning the course will be displayed on the Civil Engineering Group Notice Board only.

Instructor-in-charge