Theory   Credits: 3   3 hrs/week

I.   Learning Outcomes

After learning this course, the student will be able
1. To know the scope of Operations Research
2. To link the OR techniques with business environment and life sciences
3. To convert real life problems into mathematical models
4. To find a solution to the problem in different cases
5. To inculcate logical thinking to find a solution to the problem

II.   Syllabus

Unit – 1:
Introduction of OR – Origin and development of OR – Nature and features of OR –Scientific Method in OR – Modeling in OR – Advantages and limitations of Models-General Solution methods of OR models – Applications of Operation Research. Linear Programming problem (LPP) – Mathematical formulation of the problem - illustrations on Mathematical formulation of Linear Programming of problem.

Unit – 2:
Graphical solution of linear Programming problems with maximizing and minimizing objective function up to 3 variables. Finding convex hull and non-convex hull of LPP. Some exceptional cases - Alternative solutions, Unbounded solutions, non-existing feasible solutions by Graphical method.

Unit – 3:
General linear Programming Problem(GLP) – Definition and Matrix form of GLP problem, Slack variable, Surplus variable, unrestricted Variable, Standard form of LPP and Canonical form of LPP. Definitions of Solution, Basic Solution, Degenerate Solution, Basic feasible Solution and Optimum Basic Feasible Solution. Introduction to Simplex method and Computational procedure of simplex algorithm. Solving LPP by Simplex method (Maximization case and Minimization case up to three variables only)

Unit – 4:
Artificial variable technique - Big-M method and Two-phase simplex method, Degeneracy in LPP and method to resolve degeneracy. Alternative solution, Unbounded solution, Non existing feasible solution and Solution of simultaneous equations by Simplex method.

Unit – 5:
Duality in Linear Programming –Concept of duality -Definition of Primal and Dual Problems, General rules for converting any primal into its Dual, Relation between the solution of Primal and Dual problem (statements only). Using duality to solve primal problem. Dual Simplex Method.

Practical   Credits: 1   2 hrs/week

Practical Syllabus

1. To solve Linear Programming Problem using Graphical Method with
   i. Unbounded solution
   ii. Infeasible solution
2. Solution of LPP with simplex method.
3. Problem solving using Big M - method.
4. Problem solving using Two Phase method.
5. Illustration of following special cases in LPP using Simplex method
   iii. Unbounded solution
   iv. Alternative or multiple solutions.
6. Problems based on Principle of Duality.
7. Problems based on Dual simplex method.

III.   References

1. S.D. Sharma: Operations Research, Kedar Nath Ram Nath & Co, Meerut.
2. Kanti Swarup, P.K.Gupta, Manmohn: Operations Research, Sultan Chand and sons, NewDelhi.
3. J.K. Sharma: Operations Research and Application, Mc.Millan and Company, New Delhi.
4. Gass S.I: Linear Programming. Mc Graw Hill.
5. Hadly G: Linear Programming. Addison-Wesley.
6. Taha H.M: Operations Research: An Introduction : Mac Millan.

IV.   Suggested Co-curricular Activities:

1. Training of students by related industrial experts
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates etc on related topics.
4. Preparation of audio and videos on tools of diagrammatic and graphical representations.
5. Collection of material/figures/photos/author photoes of related topics.
6. Invited lectures and presentations of stalwarts to those topics.
7. Visits/field trips of firms, research organizations etc.