Theory	Credits: 3	3 hrs/week

I.   Learning Outcomes

After learning this course, the student will be able

1. To solve the problems in logistics
2. To find a solution for the problems having space constraints
3. To minimize the total elapsed time in an industry by efficient allocation of jobs to the suitable persons.
4. To find a solution for an adequate usage of human resources
5. To find the most plausible solutions in industries and agriculture when a randomenvironment exist.

II.   Syllabus

Unit – 1:
Transportation Problem- Introduction, Mathematical formulation of Transportation problem. Definition of Initial Basic feasible solution of Transportation problem- North-West corner rule, Lowest cost entry method, Vogel's approximation method. Method of finding optimal solution- MODI method(U-V method). Degeneracy in transportation problem, Resolution of degeneracy, Unbalanced transportation problem. Maximization of TP.

Unit – 2:
Assignment Problem -Introduction, Mathematical formulation of Assignment problem, Reduction theorem (statement only), Hungarian Method for solving Assignment for both balanced and unbalanced Assignment Problems.

Unit – 3:
Sequencing problem: Introduction and assumptions of sequencing problem, Sequencing of n jobs and one machine problem. Johnson's algorithm for n jobs and two machines problem- problems with n-jobs on two machines, algorithm for n jobs on three machines problem- problems with n- jobs on three machines, algorithm for n jobs on m machines problem, problems with n-jobs on m- machines.

Unit – 4:
GameTheory:Two-personzero-sumgames.PureandMixedstrategies.Maxmin and Minimax Principles - Saddle point and its existence. Games without Saddle point-Mixed strategies. Solution of 2 x 2 rectangular games. Graphical method of solving 2 x n and m x 2 games. Dominance Property. Matrix oddment method for n x n games. Only formulation of Linear Programming Problem for m x n games.

Unit – 5:
Network Scheduling: Basic Components of a network, nodes and arcs, events and activities– Rules of Network construction – Time calculations in networks - Critical Path method (CPM) and PERT.

Practical	Credits: 1	2 hrs/week

Practical Syllabus

1. IBFS of transportation problem by using North- West corner rule, Matrix minimum method and VAM
2. Optimum solution to balanced and unbalanced transportation problems by MODI method(both maximization and minimization cases)
3. Solution of Assignment problem using Hungarian method (both maximization and minimization cases),
4. Solution of sequencing problem—processing of n jobs through two machines
5. Solution of sequencing problem- processing of n jobs through three machines
6. To perform Project scheduling of a given project (Deterministic case-CPM).
7. To perform Project scheduling of a given project (Probabilistic case-PERT).
8. Solution of m x n games by dominance rule.

III.   References

1. S.D. Sharma: Operations Research, Kedar Nath Ram Nath & Co, Meerut.
2. Kanti Swarup, P.K.Gupta, Manmohan: Operations Research, Sultan Chand and sons, NewDelhi.
3. J.K. Sharma: Operations Research and Application, Mc. Millan and Company, New Delhi.
4. Gass: Linear Programming. Mc Graw Hill.
5. Hadly: Linrar Programming. Addison-Wesley.
6. Taha: Operations Research: An Introduction : Mac Millan.
7. Dr. NVS Raju: Operations Research, SMS education.

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.