MA842   **OPTIMIZATION ALGORITHMS**   **0 0 2 2**

Introduction and Selected Applications
Presentation of several problems and their formulation as maximum flow or minimum-cost circulation problems. Proof of Dijkstras algorithm.

Lagrangian Duality
Definition of Lagrange multipliers. Weak Lagrangian duality. Duality theorem for linear programs, examples.

Max Flow/Min Cut
Maximum flow in a network: max flow/min cut theory, Ford-Fulkerson algorithm.

Minimum Cost Circulation Problem
Sufficient conditions for optimality of a circulation (Complementary Slackness). Relation to maximum flow problem. Lagrange multipliers.

Residual Networks
Successive shortest paths algorithm or primal-dual algorithm or out-of-kilter algorithm.

Proximal Point Algorithm
Subgradients, subgradient optimality condition, proximal mapping, inverting the set-valued mapping to obtain a fixed point iteration.

TEXTBOOKS/ REFERENCES:

1. Ravindra K. Ahuja, Thomas L. Magnanti, and James B. Orlin: *Network Flows: Theory, Algorithms, and Applications,* Pearson, 1993.
2. Thomas H. Cormen, Charles E. Leiserson: *Introduction to Algorithms*, 3rd Edition, MIT Press, 2009.
3. Dimitri P. Bertsekas: *Convex Optimization Theory*, Atheana Scientific, 2009.