Numerical Optimization - Video course

COURSE OUTLINE

Introduction. Mathematical Background, including convex sets and functions. Need for constrained methods in solving constrained problems.

Unconstrained optimization: Optimality conditions, Line Search Methods, Quasi-Newton Methods, Trust Region Methods. Conjugate Gradient Methods. Least Squares Problems.

Constrained Optimization: Optimality Conditions and Duality. Convex Programming Problem. Linear Programming Problem. Quadratic Programming. Dual Methods, Penalty and Barrier Methods, Interior Point Methods.

COURSE DETAIL

Sl.No.	Topics	No.of Hours
1	Introduction: Optimization, Types of Problems and Algorithms	1
2	Background: Linear Algebra and Analysis	2
3	Convex Sets and Convex Functions	4
4	Unconstrained Optimization: Basic properties of solutions and algorithms, Global convergence	2
5	Basic Descent Methods: Line Search Methods, Steepest Descent and Newton Methods	2
6	Modified Newton methods, Globally convergent Newton Method.	2
7	Nonlinear Least Squares Problem and Algorithms	2
8	Conjugate Direction Methods	1
9	Trust-Region Methods	1
10	Constrained Optimization: First Order Necessary Conditions, Second Order Necessary Conditions, Duality, Constraint Qualification	6
11	Convex Programming Problem and Duality	2

NP-TEL

NPTEL

http://nptel.iitm.ac.in

Computer Science and Engineering

Pre-requisites:

Linear Algebra and Differential Calculus.

Additional Reading:

D. P. Bertsekas, Nonlinear Programming, Athena Scientific, 1999.

Coordinators:

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12	Linear Programming: The Simplex Method, Duality and Interior Point Methods, Karmarkar's algorithm	6
13	Transportation and Network flow problem	1
14	Quadratic Programming: Active set methods, Gradient Projection methods and sequential quadratic programming	3
15	Dual Methods: Augmented Lagrangians and cutting-plane methods	2
16	Penalty and Barrier Methods	2
17	Interior Point Methods	1

References:

1. David Luenberger and Yinyu Ye, Linear and Nonlinear Programming, 3rd Edition, Springer, 2008.
2. Fletcher R., Practical Methods of Optimization, John Wiley, 2000.