LECTURE-1

IIT Guwahati

Sep - Nov 2020 Semester
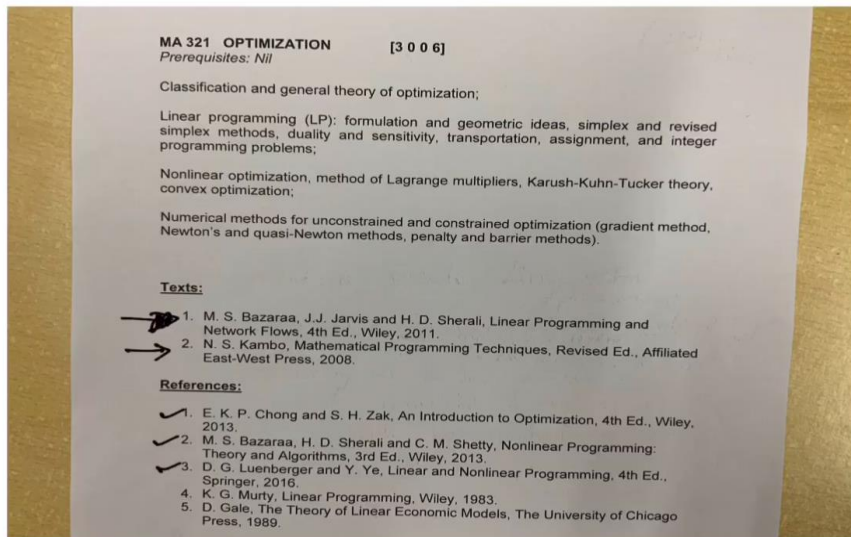
Course: MA 321

Optimization

Slot : D1

Instructor: Prof. N. Selvaraju

TAs: Dr. Abhilash Sahu

Ms. Ankita Sen

Syllabus & Texts

MA 321 OPTIMIZATION   **[3 0 0 6]**
Prerequisites: Nil

Classification and general theory of optimization;

Linear programming (LP): formulation and geometric ideas, simplex and revised simplex methods, duality and sensitivity, transportation, assignment, and integer programming problems;

Nonlinear optimization, method of Lagrange multipliers, Karush-Kuhn-Tucker theory, convex optimization;

Numerical methods for unconstrained and constrained optimization (gradient method, Newton's and quasi-Newton methods, penalty and barrier methods).

Texts:

1. M. S. Bazaraa, J.J. Jarvis and H. D. Sherali, Linear Programming and Network Flows, 4th Ed., Wiley, 2011.
2. N. S. Kambo, Mathematical Programming Techniques, Revised Ed., Affiliated East-West Press, 2008.

References:

1. E. K. P. Chong and S. H. Zak, An Introduction to Optimization, 4th Ed., Wiley, 2013.
2. M. S. Bazaraa, H. D. Sherali and C. M. Shetty, Nonlinear Programming: Theory and Algorithms, 3rd Ed., Wiley, 2013.
3. D. G. Luenberger and Y. Ye, Linear and Nonlinear Programming, 4th Ed., Springer, 2016.
4. K. G. Murty, Linear Programming, Wiley, 1983.
5. D. Gale, The Theory of Linear Economic Models, The University of Chicago Press, 1989.

$$\text{Central Concept}$$

$$\text{Optimization Problem (OP)}$$

Let $F, G \subseteq \mathbb{R}^n$ be non-empty sets
    with $F \subseteq G$

Let $f : G \longrightarrow \mathbb{R}$ be a given function

OP: Optimize $f(x)$
           Subject to $x \in F$

Solution: $x^* \in F$ $\leftarrow$ Optimal solution

$f \rightarrow$ Objective function

$F \rightarrow$ feasible set (or constraint set)

$x \in F \rightarrow$ feasible point (or feasible solution)

Optimize $\Big\langle$ $\begin{array}{l} \rightarrow \text{Maximize} \\ \rightarrow \text{Minimize} \end{array}$

$x^* \rightarrow$ Optimal solution

$F \rightarrow$ usually defined functions
        in constraint form

Linear Programming Problem (LPP)

$f \to$ linear $\qquad F \to$ defined by linear functions

Non linear programming problems (NLPP)

$f \to$ nonlinear (general) $\qquad F \to$ defined by nonlinear functions

$F = \mathbb{R}^n \implies$ unconstrained

$F \subsetneq \mathbb{R}^n \implies$ constrained

Evaluation: [Will change depending on the situation]

$4/5$ Quizzes / Assignments $\qquad$ 70 marks (approx.)

$\downarrow$

MCQ, MSQ, SA, etc. $\qquad$ Friday Slot

Final Exam (27th Nov) $\qquad$ 30 marks (approx.)

$\downarrow$

objective + descriptive.

First Quiz $\to$ 25th Sep