

## COURSE PROPOSAL: AN INTRODUCTION TO LINEAR PROGRAMMING

1. **Course Title: An Introduction to Linear Programming**
2. **Course Number:** MTHxxx (UG level)
3. **Proposing Department:** Mathematics and Statistics
4. **Proposing Instructor(s):** Malay Banerjee
5. **Other Faculty members interested:** Debasis Kundu, Saktipada Ghorai, Subhra Sankar Dhar, Keshab Chandra Bakshi
6. **Units:** 3-0-0-9
7. **Pre-requisite:** A good grasp of “Linear Algebra”.
8. **Course Description:**
  - (a) **Objectives of the course:** Linear Programming is a fundamental course within the broader field of Optimization. It has applications across several areas, including engineering design, operations research, economics, data science, and decision-making under constraints. Introducing a course on LP will help UG students prepare themselves for various application areas within Optimization Theory. The course will also strengthen their mathematical reasoning and computational skills, preparing them for advanced studies and interdisciplinary research at the undergraduate level.
  - (b) **Contents:**
    - General Introduction [3 lectures]
      - Linear Programming Problems (LPP)
      - Origin of LPP
      - Examples of LPP
    - Mathematical Preliminaries [5 lectures]
      - Matrices
      - Vectors
      - Convex Sets
      - Linear Inequalities
      - Solution of Linear System of Equations
    - LPP in general [5 lectures]
      - The LPP
      - Properties of a solution of LPP
      - Extreme points
      - Graphical method
    - Simplex Method [8 lectures]
      - Minimum Feasible Solution
      - Mathematical Calculation
      - Artificial Basis Technique
      - Basic Feasible Solution
      - Geometrical Interpretation
    - The Revised Simplex Method [5 lectures]
      - Standard form of Inverse
      - Product form of Inverse
      - Computational Steps
    - Dual Problem of LPP [5 lectures]
      - Assymmetric Primal-Dual problems
      - Symetric Primal-Dual problems

- Implication of Primal-Dual problems
- Transportation Problem (TP) [4 lectures]
  - The General form
  - Solving the TP
  - Variations of TP
- Assignment Problem [5 lectures]
  - The General form
  - Solution for Assignment Problem
  - Conversion to LPP
  - Application of Assignment Problem

9. Books/References:

- (a) J. Matoušek and B. Gärtner: Understanding and using linear programming, Springer, (2007).
- (b) F.S. Hillier and G.J. Lieberman: Introduction to Operations Research, McGraw Hill, (1967).
- (c) P.R. Thie and G.E. Keough: An Introduction to Linear Programming and Game Theory, John Wiley & Sons, (2008).
- (d) H.A. Taha: Operations Research - An Introduction, Pearson Prentice Hall, (2017).

Date: 28/11/2025

Signature of the Proposer:

Signature of DUGC Convener Mathematics and Statistics

This course is approved/not approved

Chairman, SUGC