CS 655: Topics in linear programming

- **Description**: Linear programming is a special class of mathematical optimization problems where the constraints as well as the cost function is linear. This class of problems have known efficient algorithms, deep structural properties and wide applications in various fields. The course will provide detailed introduction to the field of linear optimization.

- **Prerequisites**: Basics of linear algebra.

- **Course Contents**: We will start by covering the basics of convex optimization and linear algebra briefly. The background material will not be covered in detail; it is expected that either students know it or can read and recall it. We will move to the definition of linear programs next and show how to model various problems as a linear program. The last part of the first half will give outline of some approaches to solve a linear program.

  The later part of the course will focus on applying linear programming in theoretical computer science. We will cover many interesting applications in diverse fields such as network algorithms, complexity theory and approximation theory. If time permits, a small introduction to semidefinite programming will be given with a basic application.

- **Time and venue**: 3:30-4:45 (Mon), 2:00-3:15 (Tue) in M12, Media labs.
- **Course webpage**: https://www.cse.iitk.ac.in/users/rmittal/course_f23.php
- **Course Policies**: No attendance, Honesty Practices and Withdrawal – in accordance with the Institute, Department and DOAA norms (please see course website).
- **Evaluation Components**: Please check the course website.
- **Books & References**: No specific textbook. Relevant references and texts (if needed) will be posted on the course homepage from time to time. Some of the following books may be useful.
    - Linear algebra and its applications, Gilbert Strang.
    - Combinatorial optimization: algorithms and complexity, Papadimitriou and Steiglitz
    - Convex optimization, Boyd and Vandenberghe.