

Syllabus of the Comprehensive Exam

MATH 581 Advanced Linear Programming

Topics

- **Theory of linear programming:** Simplex Algorithm, Two phase simplex method, Big-M simplex method.
- **Duality theory:** weak and strong duality theorems, Complementary slackness conditions, Dual simplex method.
- **Integer Programming:** Branch and Bound, and Cutting Plane methods.
- **Transportation problem:** North-West corner, Least cost and Vogel's methods, and u-v-method for optimality) and assignment problem (Hungarian method.
- **Linear fractional programming:** Charnes-Cooper method.
- **Convex functions and properties:** Karush-Kuhn Tucker conditions, Wolfe method.
- **Sensitivity Analysis:** Change in cost vector, Change in right-hand side, Change in adding new constraints, Adding new decision variables, and change in the coefficient of a matrix A.
- **Revised Simplex Method:** Revised two-phase Simplex Method, Revised Big-M Simplex Method.
- **Karmarkar's Algorithm for linear programming problems**

References

- Robert J. Vanderbei, *Linear Programming Foundations and Extensions*, 5th Edition Springer (2020)
- Hamdy A. Taha, *Operations Research - An Introduction*, 10th Edition, 2017, Pearson