Math 435 – Linear Optimization

Course Description from Bulletin: Introduction to both theoretical and algorithmic aspects of linear optimization: geometry of linear programs, simplex method, anticycling, duality theory and dual simplex method, sensitivity analysis, large scale optimization via Dantzig-Wolfe decomposition and Benders decomposition, interior point methods,

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Existence and optimality of extreme points

3. Simplex Method 9
   - Optimality conditions
   - Simplex method
   - Revised simplex method and full tableau implementation
   - Anticycling: Bland's rule
   - Initial basic feasible solution
   - Computational efficiency of the simplex method
4. Duality Theory and Sensitivity analysis 7
   - Dual linear program
   - Duality Theorems and Complementary Slackness
   - Dual Simplex method
   - Farkas' Lemma and its application to duality theorem
   - Sensitivity analysis and Parametric programming
5. Large Scale Optimization 5
   - Delayed column generation and Dantzig-Wolfe decomposition
   - Cutting plane methods and Benders decomposition

6. Optional Topics (selected based on class composition and background) 11
   - Interior Point Methods
     - The von Neumann algorithm
     - The affine scaling algorithm
     - The primal path following algorithm
   - Network Flow Problems
     - The minimum cost flow problem and the Network simplex algorithm
     - The maximum flow problem and the Ford-Fulkerson algorithm
     - The assignment problem and the Auction algorithm
   - Integer Programming
     - Gomory Cuts and Cutting plane algorithms
     - Branch and bound
     - Dynamic programming
     - IP duality and Lagrangian Relaxation

7. Exams and Overflow 3

Assessment:	Homework	25-50%
	Quizzes/Tests	30-50%
	Final Exam	25-40%

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