Here is a brief list of materials covered.

- Introduction of linear programming (LP) problems. Formulation of LP.
- The geometry of LP.
  - Corner points and basic feasible solution
  - Neighboring corner points and neighboring basic feasible solutions.
- Simplex algorithm.
  - Standard Simplex algorithm in tabular form.
  - Potential break-down of the algorithm.
  - Degenerate LP and cycling.
- Variants of Simplex algorithm: Big-M method and two-phase method.
- Duality theory
  - The formulation of dual LP
  - The weak and strong dual principle
  - The complete slackness theorem
  - The economic interpretation of dual LP.
  - Applications of dual method: Farkas theorem, Markov chains.
- Sensitivity analysis.
- Game theory
  - Two-person zero sum game
  - The definition of pure strategy and mixed-strategy
  - The minimax condition
  - The existence of value and mixed-strategy saddle point
  - Extensions to two-person non-zero sum games, n-person games.
- Dynamic Programming
  - Why dynamic programming (DP)? Examples of shortest path, heaviest coin, and American option pricing.
  - The general formulation of deterministic dynamic programming.
  - The dynamic programming equation (DPE). The interpretation of DPE.
  - Shortest path problems for general network.
  - Knapsack problem, Turnpike theorem, and general Resource allocation problem.
  - Introduction to probabilistic dynamic programming, and its applications to Decision Analysis.

- Integer programming.
  - Formulation of an integer programming problem.
  - The Brach-and-Bound method.
- Quadratic programming.