- Greedy algorithms:
  - spanning trees, Steiner trees, matroids, arborescences, and multicast cost-sharing. (Using Kozen Lec2-3, and Kleinberg-Tardos chapter 4)
- Advanced data structures:
  - Union find (Kleinberg-Tardos 4.6 or Kozen Lec 10), heaps (Kleinberg-Tardos 2.5 and Kozen Lec 8-9, self-organizing data-structures (Kozen Lec 12).
- Dynamic programming.
  - basic dynamic programming technique, dynamic programming on trees, tree decomposition, and algorithms for graphs with bounded tree width. (Using Kleinberg-Tardos chapter 6 and section 10.4-10.5)
- Network Flows:
  - maximum flows and minimum cuts, the preflow-push algorithm, minimum-cost flows, multicommodity flows, and applications to matching, scheduling, network routing and vision. (Using Kleinberg-Tardos Chapter 7 and Section 12.6)
- NP-completeness:
  - This topic is discussed extensively in the undergraduate course, CS 482. The coverage here will be briefer. (Using Kleinberg-Tardos Chapter 8.)
- Algorithms for hard problems
  - Approximation Algorithms: greedy algorithms, local search, on-line algorithms, primal-dual algorithms, the use of linear programming. (Using Kleinberg-Tardos Chapter 11)
- Randomized Algorithms:
  - basic techniques from discrete probability, and applications to optimization, distributed computation, and packet routing. (Using Kleinberg-Tardos Chapter 13)
- Algorithmic Game Theory:
  - Routing and Network Design. (Using Kleinberg-Tardos Chapter 12.7)