MAT 3770—Exam 3 Topics

- 3.3 : Spanning Trees
  - Minimal spanning trees: Kruskal & Prim Algorithms
  - Union–Find data structure: finds and merges; path compression, time complexities
  - heaps: $O(n \log n)$ and $O(n)$ heapifies; heapsort
- 3.4 : Traveling Salesperson Problem
  - Brute Force - optimal
  - Nearest Neighbor
  - Branch and Bound Search strategy - optimal
- 4.1 : Single Source Shortest Paths, Dijkstra's Shortest Path Algorithm
- Steiner Trees:
  - Minimal Spanning Tree vs Steiner Spanning Tree
  - Rectilinear metric
  - bounding rectangle; grid imposed by points
  - Optimal vs Heuristics
  - Performance guarantees
- Categories of Algorithms
  1. Solvable vs Unsolvable
  2. P and NP Sets
  3. NP-Complete and NP-Hard Problem Sets
- Algorithmic Paradigms
  1. Optimal vs Sub-Optimal
  2. Approximation Algorithms — Performance Ration = $\frac{approximatesolution}{optimalsolution}$
  3. Exhaustive Search — Branch & Bound; Greedy Approach, Dynamic Programming, Hierarchical Approach (Divide & Conquer), Mathematical Programming, Simulated Annealing, Stochastic Evolution, and Genetic Algorithms
- 4.2 : Flow Network
  - Capacity
  - Flows, constraints, Max-flow Min-cut Theorem
  - Residual Network
  - Augmenting Path
  - Cuts
  - Ford–Fulkerson Algorithm