

MATH 312 - SUMMARY OF SYLLABUS

- 1.1 - basic definitions, isomorphism, decomposition, Petersen graph
- 1.2 - walks/trails, components, cut-edges, bipartite graphs, Eulerian graphs
- 1.2 - induction, extremality
- 1.3 - degree-sum formula, k -dimensional cube, large bipartite subgraphs
- 1.3 - largest triangle-free graphs, induction trap, degree sequences (Havel-Hakimi)
- 1.4 - digraphs, tournaments

- 2.1 - Tree properties, distance, diameter
- 2.2 - Cayley's Formula, recursion to count spanning trees
- 2.3 - Kruskal's algorithm, Dijkstra's algorithm, Chinese Postman Problem

- 3.1 - maximum matching vs. augmenting path, Hall's condition, Marriage theorem
- 3.1 - vertex cover, Konig-Egervary Theorem, independence number vs edge cover
- 3.2 - augmenting path algorithm, weighted bipartite matching
- 3.3 - Tutte's Theorem, join, Berge-Tutte Formula, Petersen's Theorems

- 4.1 - connectivity, k -connected, bonds, blocks
- 4.2 - expansion lemma, subdivision, ear decomposition,
- 4.2 - Menger's Theorem(s), line graphs, Fan Lemma
- 4.3 - network flow problem, augmenting path, labeling algorithm
- 4.3 - Max Flow-Min Cut Theorem, Integrality Theorem

- 5.1 - proper coloring, k -colorable, chromatic number, cartesian product
- 5.1 - greedy coloring, Szekers-Wilf bound, Gallai-Roy Theorem, Brooks' Theorem
- 5.2 - Mycielski construction, color-critical graph, Turán's Theorem, S -lobe
- 5.3 - chromatic polynomial, chromatic recurrence
- 5.3 - chordal graph, simplicial elimination ordering, (perfect graph)

- 6.1 - planar graphs, dual graphs, euler's formula, maximal planar graphs
- 6.2 - Kuratowski's Theorem, convex embeddings
- 6.3 - Five/Four Color Theorem, crossing number

- 7.1 - edge-coloring, line graph, 1-factorization, Vizing's Theorem
- 7.2 - Hamiltonian cycles, necessary condition
- 7.2 - closure, sufficient conditions (Dirac, Ore, Chvátal, Chvátal-Erdős)
- 7.3 - Tait's Theorem, Grinberg's Theorem