Math 375  Introduction to Discrete Mathematics  (4 semester hours)

Course Description:

An introduction to the concepts fundamental to the analysis of algorithms and their realization. Topics covered will include combinatorics, generating functions, recurrence relations, graph theory, and networks.

Prerequisites: MATH 247 and MATH 290 with grade of “C” (2.0) or higher.

Learning Outcomes:

Students will be able to
1. Use counting arguments to enumerate discrete objects, solve problems in discrete probability, and analyze the complexity of algorithms.
2. Model problems in discrete mathematics by graphs
3. Use the definitions, theorems, and algorithms of graph theory to solve problems which can be modeled by graphs.

Content Outline:

1. Enumerative combinatorics: addition rule, multiplication rule, permutations, combinations, distributions, binomial coefficients, binomial identities, generating functions, homogeneous and inhomogeneous recurrence relations, the principle of inclusion-exclusion.
2. Graph theory: graphs, graph isomorphisms, connectedness, trees, chromatic number, planarity, Euler cycles, Hamilton circuits, graph models.
3. Graph algorithms and analysis: depth-first search, breadth-first search, Dijkstra's algorithm for finding shortest paths in a graph, Prim's algorithm for finding a minimal spanning tree in a weighted graph, the branch-and-bound technique and the optimal tour construction for finding a low-weight Hamilton cycle in a weighted graph, network flow, the max flow-min cut theorem, algorithmic matching.

Recommended Textbooks:

1. Applied Combinatorics, Alan Tucker, Wiley.
3. Combinatorics and Graph Theory, John Harris, Jeffry L. Hirst, and Michael Mossinghoff, Springer.