Master Syllabus for TCSS 322
Version: September 2009

The **primary goals** of the course are:

1. Knowledge of advanced discrete mathematics concepts (relations, graphs, trees).
2. Knowledge of computational models and formalisms (finite state machines, grammars, Turing machines).
3. Understanding of mathematical and formal techniques to model computational problems.

Prerequisites: TCSS 321, programming experience (at least TCSS 143).

Topics covered

1. Counting
    a. counting, inclusion-exclusion
    b. pigeonhole principle
    c. permutations and combinations
    d. basic probability
2. Advanced Counting Techniques
    a. Recurrence relations
    b. Inclusion-exclusion
3. Graphs
    a. Terminology, representation
    b. Graph problems: connectivity, Euler and Hamiltonian paths, coloring, matchings
    c. Shortest-path problems
4. Trees
    a. Applications
    b. Tree Traversals
    c. Spanning trees, minimum cost spanning trees
5. Modeling Computation
    a. Languages
    b. Finite state machines
    c. Regular expressions, grammars
    d. Turing machines

Postconditions

1. Knowledge, understanding, and skill at manipulating mathematical abstractions listed above.