SU DEPARTMENT OF MATHEMATICS & COMPUTER SCIENCE
SYLLABUS *(Tentative)*
COSC 320 *Advanced Data Structures & Algorithm Analysis*

Description: In this course, algorithm complexity analysis, algorithm design technique (greedy methods, divide and conquer, dynamic programming) and efficient algorithms for various problems will be introduced. Advanced data structure such as hash tables, binary search trees and red-black tree will be explored. The notion of NP-completeness and NP-complete problems will also be covered. Three hours lecture and two hours lab per week.

Prerequisites: COSC 220 and MATH 210, both completed with a grade of C or better.
Required Text: *No required textbook.*
References:
- Introduction to Algorithms, 3rd edition by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein
- Algorithms, 4th edition by Robert Sedgewick and Kevin Wayne
- Data Structures and Algorithm Analysis in Java, 3rd edition by Mark A. Weiss

	Weeks
Mathematical Foundations for Algorithm Analysis	**2.0**

Set Notation, Asymptotic Notations (Big-Θ, Big-O and Big-Ω, little-o, little-ω notations), Best-Case, Worst-Case, Average-Case running times.

Sorting Algorithms and Analysis	**3.0**

Insertion Sort, Selection Sort, Bubble Sort, Shell Sort, Merge Sort, Heap Sort, Quick Sort, Radix Sort, Bucket Sort and analysis of these algorithms.

Advanced Data Structures	**4.0**

Binary Search Trees, various Balanced Binary Search Trees, Red-Black Trees, Heaps and Priority Queues, Disjoint Set Data Structures, Hash Tables and analysis of algorithms that use these data structures.

Graph Algorithms	**3.0**

Representations of Graphs, Breadth-First Search, Depth-First Search, Minimum Spanning Tree, Shortest Path Algorithm, Maximum Flow, and analysis of these algorithms.

NP-Completeness	**1.0**

Polynomial time, Polynomial time verification, NP-completeness and reducibility

Test	**1.0**

	14.0

EVALUATION
Exams: 40-60%
Labs, Projects: 40-60%

NOTE: ONCE A STUDENT HAS RECEIVED CREDIT, INCLUDING TRANSFER CREDIT, FOR A COURSE, CREDIT MAY NOT BE RECEIVED FOR ANY COURSE WITH MATERIAL THAT IS EQUIVALENT TO IT OR IS A PREREQUISITE FOR IT.