MASTER SYLLABUS
(Generic Outline)

Administrative Unit: Computer and Mathematical Sciences Department

Course Prefix and Number: CISS 350

Course Title: Advanced Algorithms and Data Structures

Number of: Credit Hours: 3  Lecture Hours: 3  Laboratory Hours: 0

Catalog Description: Advanced concepts of data, storage, organization, and retrieval. Topics include multiple-linked lists, balanced trees, graphs, abstract data types, classes and methods, object-oriented programming, searching and sorting. Prerequisites: CISS 245 or (CISS 242 and CISS 243) with at least a grade of C. Offered Spring.

Prerequisite(s)/Corequisite(s): CISS 245 or (CISS 242 and CISS 243) with at least a grade of C.

Text(s): Most current editions of the following:

Ford, W. & Topp, W.  Data Structures with C++ Using STL. Prentice Hall.

Dale, N.  C++ Data Structures.  Jones and Bartlett.

Course Objectives:

• To develop and analyze algorithms to create and manipulate data structures including multiple-linked lists, circular-linked lists, queues, trees including binary trees, B-trees, AVL trees, graphs.
• To use several of the Standard Template Library Classes.
• To implement and compare the time and space complexities of different searching and sorting algorithms.
• To implement data structures using the object-oriented paradigm.
• To understand and use programming techniques such as divide-and-conquer, backtracking, and dynamic programming.

Measurable Learning Outcomes:

• Use various STL classes.
• Implement doubly-linked list class.
• Implement circular-linked list class.
• Implement queue class.
• Implement tree class including binary trees, B-tree, AVL trees.
• Implement graph algorithms.
• Understand and implement divide-and-conquer technique.
• Understand and implement backtracking technique.
• Understand and implement dynamic programming technique.
• Compare and contrast the time and space complexity of data structure and algorithms.

Topical Outline (major areas of coverage):
• Sorting including quicksort, selection sort, and heap sort.
• Analysis of algorithms, big-oh notation.
• STL classes.
• Doubly-linked lists.
• Binary trees and binary search trees.
• Infix, prefix and postfix expressions.
• Queues.
• Hashing and hashing algorithms.
• 2-3-4 trees.
• B-trees.
• Heaps and priority queues.
• Divide-and-conquer algorithms.
• Dynamic programming.

Recommended maximum class size for this course: 20

Library Resources: Online databases are available at http://www.ccis.edu/offices/library/resources.asp. You may access them from off-campus using your eServices login and password when prompted.

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NOTE: The intention of the master syllabus is to provide an outline of the contents of this course, as specified by the faculty of Columbia College, regardless of who teaches the course, when it is taught or where it is taught. Faculty members teaching this course for Columbia College are expected to facilitate learning pursuant to the course objectives and cover the subjects listed in the topical outline. However, instructors are also encouraged to cover additional topics of interest so long as those topics are relevant to the course’s subject. The master syllabus is, therefore, prescriptive in nature but also allows for a diversity of individual approaches to course material.

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