University of International Business and Economics

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International Summer School

CS 310 Data Structures and Algorithms

Term: May 24 – June 24, 2021
Instructor: Dr. An
Home Institution: UT Martin
Email: uibe310@hotmail.com
Class Hours: Monday through Thursday, 120 minutes each day (2,400 minutes in total)
Discussion Session: 2 hours each week
Office Hours: TBD

Total Contact Hours: 64 contact hours (45 minutes each, 48 hours in total)
Location: WEB
Credit: 4 units

Course Description:

This course will introduce you to advanced data structures and algorithms in computer science including balanced search trees, hashing, heaps, algorithm runtime analysis, greedy algorithms, divide and conquer technique, dynamic programming, graph algorithms, amortized analysis and probabilistic analysis.

Prerequisite:

You must have a good knowledge of basic data structures and algorithms and calculus/discrete mathematics.

Course Goals:

A student who satisfactorily completes this course should be able to accomplish the following:

1. Find and prove runtime bounds for iterative and recursive algorithms and prove the correctness of algorithms.
2. Design efficient algorithms to solve computational problems.
3. Understand and employ algorithm design paradigms including divide and conquer, dynamic programming, and greedy algorithms in solving varied computational problems.
4. Implement complex algorithms and data structures with a modern high level programming language.

Required Textbook:

Cormen, Leiserson, Rivest, & Stein, Introduction to Algorithms. 3rd Edition, MIT Press 2009. ISBN-13 978-0262033848.

Grading Policy:

- Programming Projects 20%
- Home Assignments 20%
- Quizzes 10%
- Attendance 10%
- Midterm 15%
- Final 25%

Grading Scale:

Assignments and examinations will be graded according to the following grade scale:

A	90-100	**C+**	72-74
A-	85-89	**C**	68-71
B+	82-84	**C-**	64-67
B	78-81	**D**	60-63
B-	75-77	**F**	below 60

Academic Integrity:

If students are found to be in violation of the academic honesty policy, the professor reserves the right to seek disciplinary action as allowable by university policy. Such actions may include, but are not limited to, giving the student a zero on the assignment and/or class.

Course Schedule:

Date	Lecture	Readings
Day 1	Definition of Algorithm, Pseudocode Conventions, Recursive Algorithms	CLRS: 1.1, 1.2 HSR: 1.2
Day 2	Insertion Sort, Correctness	CLRS: 2.1-2.3 HSR: 1.2
Day 3	Time and Space Complexities, Common Functions, Mathematical Preliminaries	CLRS: 3.1, 3.2 HSR: 1.3
Day 4	Divide and Conquer - Merge Sort	CLRS: 2.3 HSR 3.4
Day 5	Divide and Conquer – Quicksort	CLRS: 7.1 HSR: 3.5
Day 6	Quicksort Analysis, Randomized Quicksort	CLRS: 7.2-7.3 HSR: 3.5

Day 7	Heaps and Heapsort	CLRS: 6.1-6.4 HSR: 2.4.1-2.4.2
Day 8	Lower Bounds for Sorting	CLRS: 8.1
Day 9	Counting Sort, Radix Sort	CLRS: 8.2, 8.3
Day 10	Midterm Exam	
Day 11	Approximation Algorithms, Local Search, Travelling Salesman Problem	CLRS: 35.2
Day 12	Travelling Salesman Problem	CLRS: 35.2
Day 13	Binary Search, Binary Search Trees and AVL Trees	CLRS: 12.3 HSR: 2.3.1
Day 14	AVL Trees	CLRS: 12.3 HSR: 2.3.1
Day 15	Graphs and Search of Graphs, DFS, BFS	CLRS: 22.1-22.3 HSR: 6.2.1-6.2. 2
Day 16	Greedy Algorithms - Minimum Spanning Trees	CLRS: 23.2 HSR: 4.5.1-4.5.2
Day 17	Dynamic Programming – Single Source Shortest Paths	CLRS: 24.3 HSR: 5.1, 5.4
Day 18	Dynamic Programming – All Pairs Shortest Paths	CLRS 25.2 HSR: 5.3
Day 19	Greedy algorithms – Huffman Codes	CLRS: 16.3
Day 20	Final Exam	