



**University of International Business and Economics
International Summer School**

CS 310 Data Structures and Algorithms

Term: May 25 – June 25, 2020

Instructor: Dr. Xiangdong An, Assistant Professor of Computer Science

Home Institution: UT Martin

Email: xan@utm.edu

Class Hours: Monday through Thursday, 120 minutes each day (2,400 minutes in total)

Office Hours: TBD

Discussion Session: 2 hours each week

Total Contact Hours: 64 contact hours (45 minutes each, 48 hours in total)

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 have 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 (3)	30%
Home Assignments (5)	15%
Midterm	20%
Final	30%
Attendance	5%

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

Class Rules:

- In order to provide the best possible learning environment for all students you are asked to forgo the use of electronic devices (laptops, tablets, cell phones, recording devices, etc.) during class. Special permission to use a specific electronic device may be granted on an individual basis, but it is the student's responsibility to get special permission from the instructor before use.
- All students are required to attend all classes and be responsible for all material covered in class and otherwise assigned. Any unexcused absence may impact a student's grade.
- All students are required to participate in class discussions and complete required work on time. Late work is not accepted.

Attendance Policy:

Summer school is very intense and to be successful, students are required to attend every class. Occasionally, due to illness or other unavoidable circumstance, a student may need to miss a class. Missing a class can be excused with a medical certificate, but the student is still responsible for the materials covered in the class and any assignments due that day. Any unexcused absence may affect the student's grade.

Academic Integrity:

Academic integrity is the hallmark of University studies, and is key to a successful professional career. If one or more 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:

Day 1, Mon: Mathematical preliminaries
Day 2, Tues: Algorithm runtime analysis
Day 3, Wed: The Master theorem
Day 4, Thurs: Disjoint sets
Day 5, Mon: Hashing
Day 6, Tues: Balanced search trees
Day 7, Wed: Heapsort
Day 8, Thurs: Graph algorithms
Day 9, Mon: Depth-first search (DFS) and broad-first search (BFS)
Day 10, Tues: Midterm
Day 11, Wed: Topological ordering
Day 12, Thurs: Shortest paths in graphs
Day 13, Mon: Minimum spanning tree
Day 14, Tues: Huffman coding
Day 15, Wed: Divide and conquer
Day 16, Thurs: Greedy algorithms
Day 17, Mon: Dynamic programming
Day 18, Tues: Amortized analysis
Day 19, Wed: Probabilistic analysis
Day 20, Thurs: Final exam