

# UMass Boston CS310-02, Fall 2023

## Advanced Algorithms

<b>Lectures</b>	Tuesday & Thursday 4:00–5:15, W-1-0004
<b>Instructor</b>	Ming Ouyang Email: <a href="mailto:ming.ouyang@umb.edu">ming.ouyang@umb.edu</a> Office: M-3-201-25 Office hours: Monday–Thursday 2:30–3:30
<b>TA</b>	Woody Lin Email: <a href="mailto:wancheng.lin001@umb.edu">wancheng.lin001@umb.edu</a>
<b>Textbook</b>	Cormen, Leiserson, Rivest, and Stein. Introduction to Algorithms, Fourth Edition, The MIT Press, 2022
<b>Blackboard</b>	course materials are posted on <a href="https://umb.umassonline.net/">https://umb.umassonline.net/</a>

### Course Description

This course is a systematic study of the methods of structuring and manipulating data in computing, and the design and analysis of algorithms.

No courses required by the CS major, minor, or certificate may be taken pass/fail.

### Prerequisites

- CS 210
  - basic data structures—arrays, lists, queues, priority queues, stacks, trees, hash tables, sets, maps
  - basic algorithms—searching, sorting
- CS 220—counting, probabilities, statistics
- CS 240

### Evaluation

There are ten homework assignments and two tests. Each homework assignment is 7% of the total score. Homework must be typeset with software such as notepad, Microsoft Word, and L<sup>A</sup>T<sub>E</sub>X, and converted to PDF for submission. Handwritten answers are rejected. Your homework must be uploaded to the CS Linux server before the deadline. Late submission is ignored. The two tests are oral exams. Students form teams of two. Each team answers the instructor’s questions in a 30-minute session. There is no final exam.

- 70%: ten homework assignments
- 15%: Test 1
- 15%: Test 2

The total score  $S$  is converted to a letter grade according to the following table.

$90 \leq S$	A
$87 \leq S < 90$	A-
$84 \leq S < 87$	B+
$81 \leq S < 84$	B
$78 \leq S < 81$	B-
$75 \leq S < 78$	C+
$72 \leq S < 75$	C
$69 \leq S < 72$	C-
$66 \leq S < 69$	D+
$63 \leq S < 66$	D
$60 \leq S < 63$	D-
$S < 60$	F

### **Accommodation**

Section 504 of the Rehabilitation Act of 1973 offers guidelines and support for curriculum modifications and adaptations for students with documented disabilities. If applicable, students may obtain adaptation recommendations from the Ross Center for Disability Services, Campus Center, Upper Level, Room 0211, 617-287-7430. The student must present these recommendations and discuss them with each professor within a reasonable period, preferably by the end of Drop/Add period.

### **Code of Conduct**

It is the expressed policy of the University that every aspect of academic life – not only formal coursework situations, but also all relationships and interactions connected to the educational process – shall be conducted in an absolutely and uncompromisingly honest manner. The University presupposes that any submission of work for academic credit is the students own and is in compliance with University policies, including its policies on appropriate citation and plagiarism. These policies are spelled out in the Code of Conduct [http://www.umb.edu/life\\_on\\_campus/policies/community/code](http://www.umb.edu/life_on_campus/policies/community/code).

### **Reserve Clause**

The instructor reserves the right to make changes in the syllabus when necessary to meet the learning objectives, to compensate for missed classes, schedule changes, or hardware, software, and network failures, or for similar legitimate reasons.

## Tentative Schedule

week	date	chapter	topic	homework
1	Tue 9/5	1	introduction	
	Thu 9/7	2	getting started	
2	Tue 9/12	3	characterizing running time	1
	Thu 9/14	3	characterizing running time	
3	Tue 9/19	4	divide-and-conquer	
	Thu 9/21	4	divide-and-conquer	2
4	Tue 9/26	5	probabilistic analysis and randomized algorithms	
	Thu 9/28	5	probabilistic analysis and randomized algorithms	3
5	Tue 10/3	6, 7	heapsort and quicksort	
	Thu 10/5	8	sorting in linear time	4
6	Tue 10/10	9	medians and order statistics	
	Thu 10/12	10, 12, 13	elementary data structures	5
7	Tue 10/17		test 1	
	Thu 10/19		test 1	
8	Tue 10/24	11	hash table	
	Thu 10/26	14	dynamic programming	6
9	Tue 10/31	14	dynamic programming	
	Thu 11/2	15	greedy algorithms	7
10	Tue 11/7	15	Huffman code	
	Thu 11/9	15	move-to-front & Burrows-Wheeler transformations	8
11	Tue 11/14	16	amortized analysis	
	Thu 11/16	17	augmenting data structures	9
12	Tue 11/21	18	B-trees	
	Thu 11/23	19	data structures for disjoint sets	10
13	Tue 11/28	20	elementary graph algorithms	
	Thu 11/30	20	elementary graph algorithms	
14	Tue 12/5		test 2	
	Thu 12/7		test 2	
15	Tue 12/12		TBD	