Boston University Metropolitan College

BOSTON UNIVERSITY

Analysis of Algorithms A1

CS 566

On Campus

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Course Description

This course covers Analysis of Algorithms in a practically oriented way using Python as the primary programming language. Students will implement algorithms in class and at home. Students will receive practical knowledge that will allow them to successfully design and analyze modern computer science algorithms. This course establishes the relationship between algorithms and programming and teaches the concepts of algorithmic analysis.

Books

Cormen, T. H. & Leiserson C. E. (2022). Introduction to Algorithms, third edition. The MIT Press. Retrieved from: https://www.amazon.com/Introduction-Algorithms-fourth-Thomas-Cormen/dp/026204630X

Courseware

Blackboard link
Leetcode link
Codeforces link
Zoomlink for zoom lectures link

Class Policies

1) **Attendance & Absences** – this course emphasizes a lot on practice and requires full attendance on lectures. Working laptops with full charge batteries are necessary as they are needed for passing the in-lecture submissions. During all lectures students are going to implement at least one of the algorithms that is covered by theoretical material. The lectures will consist of 50% theory and 50% practice and will be organized as “Reverse Seminars” - this means that students first are presented with an algorithmic problem and then they try to solve it. After trial-and-error students get familiar with necessary theoretical concepts and submit the solution to the grading system after the lecture.

2) **Assignment Completion & Late Work** – every week students will have to pass algorithmic problems in-lecture (easy/medium/hard level problems) and algorithmic problems in homework (medium level problem or theoretical analysis of given algorithm). The time for submission of algorithmic in-lecture problem is 3 days, by Friday the same week 11:59 PM. The time for submission of homework algorithmic problem or theoretical analysis is 6 days, by Monday the next week 11:59 PM. Late submissions are not possible.
3) **Academic Conduct Code** – Cheating and plagiarism will not be tolerated in any Metropolitan College course. They will result in no credit for the assignment or examination and may lead to disciplinary actions. Please take the time to review the Student Academic Conduct Code:

http://www.bu.edu/met/metropolitan_college_people/student/resources/conduct/code.html. This should not be understood as a discouragement for discussing the material or your particular approach to a problem with other students in the class. On the contrary – you should share your thoughts, questions and solutions. Naturally, if you choose to work in a group, you will be expected to come up with more than one and highly original solutions rather than the same mistakes.”

Grading Criteria

Grades are calculated as a weighted combination of all in-class problems, homework algorithmic problems, theoretical problems and Presenting Lab. In-class problems and homework problems cost 100 points each. Presenting Lab costs 500 points. Every student must do Presenting Lab at least once.

Class Meetings, Lectures & Assignments

There will be lectures every week for the following set of topics. We will examine various topics starting from basics such as growth of functions and elementary data structures to advanced data structures and NP-completeness.

Lectures, Readings, and Assignments subject to change, and will be announced in class as applicable within a reasonable time frame.

Date	Topic	Readings Due	Assignments Due
September 3	Introduction to Algorithms. Two approaches to teaching. Growth of Functions. Elementary Data Structures. Linked Lists and Arrays.	Chapters. 1, 2, 3	n/a
September 10	Sorting. Insertion Sort, Selection Sort and Bubble Sort. Recursion, Tail Recursion and Divide-And-Conquer.	Ch. 4	Assignments of first week
September 17	Merge Sort. Master Theorem. Lower Bound for sorting.	Ch 1, 2, 3, 4 First pages of Ch 8	Assignments of second week
September 24	Heapsort. Linear Sorting. Counting Sort. Bucket Sort.	Ch 6, 8, 9	Assignments of third week

	Medians and Order statistics		
October 1	Stacks. Queues. Linked Lists Revisited.	Ch 10	Assignments of fourth week
October 8	Binary Search. 3 use-cases of Binary Search.	N/A	Assignments of fifth week
October 15	No-Class	N/A	N/A
October 22	Binary Trees. Binary Search Trees.	Ch 12, 13	Assignments of sixth week
October 29	Dynamic programming. Top-down approach and bottom-up approach.	Ch 14	Assignments of seventh week
November 5	Dynamic programming, Part 2. Amortized Analysis.	Ch 14, 16	Assignments of eight week
November 12	Greedy Algorithms. Global optimality problem.	Ch 15	Assignments of ninth week
November 19	Graph Algorithms. Minimum Spanning Trees.	Ch 22, 23	Assignments of tenth week
November 26	String Matching. Knutt-Moris-Pratt algorithm	Ch 32	Assignments of eleventh week
December 3	Matrix Operations	Ch 28	Assignments of twelve week
December 10	NP-completeness	Ch 32	Assignments of thirteenth week