

APPLIED ALGORITHMS - FALL'23

CSCI-B505/INFO-I500

TUESDAY-THURSDAY (8592) CLASS

TENTATIVE SYLLABUS

M. Oğuzhan Külekci
okulekci@iu.edu

Welcome to the "Applied Algorithms" course in Fall 2023 semester. In this course, we will focus on enhancing our skills in algorithm design and analysis by visiting computational challenges in real-world applications. The TENTATIVE schedule provided on the last page of this syllabus summarizes the topics that we plan to cover in this journey, during which, we will be exploring the elegance, intelligence, fun, and joy of computing.

Prerequisites: We assume the students enrolling in this course

- i. have the basic undergraduate knowledge of algorithms and data structures,
- ii. can code in *Python*, and
- iii. have the undergraduate knowledge on probability and discrete mathematics.

Grading:

- Homework : 45%. (Your average will be computed by excluding your worst score.)
- Average of the first and second evaluations: 20%
- Average of the third and fourth evaluations: 25%
- LAB attendance & performance: 10%

Text books and learning materials: There are many great textbooks on algorithms and data structures that you can refer to. Particularly, I would like to suggest the following ones listed below. Remember that additional papers and reading materials may be provided during the lectures.

- The Algorithm Design Manual, 3rd Edition by Steven Skiena
- Introduction to Algorithms, Cormen *et al.*
- Data Structures and Algorithms in Python (or in Java or in C/C++), Goodrich *et al.*

Important notes about the execution of the course:

- **Assignments:** Tentative dates of the assignments announcements and due dates are as follows:

HW #	Announcement	Due
1	09/01/2023 Friday	09/10/2023 Sunday 11:59 pm
2	09/08/2023 Friday	09/15/2023 Friday 11:59 pm
3	09/15/2023 Friday	10/01/2023 Sunday 11:59 pm
4	09/29/2023 Friday	10/16/2023 Monday 11:59 pm
5	10/12/2023 Thursday	10/29/2023 Sunday 11:59 pm
6	10/27/2023 Friday	11/12/2023 Sunday 11:59 pm
7	11/10/2023 Friday	11/27/2023 Monday 11:59 pm
8	11/17/2023 Friday	12/04/2023 Monday 11:59 pm

Please note that you will be doing the coding exercises in Python. THE HOMEWORKS WILL BE EVALUATED BY AN AUTO-GRADER!. Instructions regarding the auto-grader will be provided before the first homework.

- Cheating and plagiarism is strictly forbidden and the related policies of the university will be followed. Please check code of academic ethics at <https://policies.iu.edu/policies/aca-33-code-academic-ethics/index.html>.
- Homework should be done individually. No group work allowed. **We will be following the similarity between the submissions and all available internet resources.** Significant similarities will be investigated deeply and detection of any plagiarism is subject to policies of the university. Please, pay attention to submit your own work!
- **Late submission of homework assignments will never be accepted regardless of what the situation is.** Considering that your average point of homework assignments will be computed by excluding your worst score, you can use this opportunity to amortize any unfortunate event you may experience during the semester.
- This course **does not** aim to teach any programming, but only to enhance your skills in algorithms. You will be doing a lot of coding during this term, but we have no special intention to improve your programming practice.
- LAB sessions will focus on improving your understanding via working on real coding exercises. At each LAB you will be introduced some coding exercises, and you are expected to work on solving it. Both your attendance to the LAB and your efforts during the LAB session will be considered for your LAB grade.
- You can visit the instructor and the teaching assistants on the specified office hours without any need to a prior appointment.
- We will be following the policies of the Indiana University Bloomington, whenever required. You can reach these policies at <https://policies.iu.edu/index.html>. Please check the regarding rules and regulations particularly for the code of ethics, code of conduct, and particularly, the COVID updates <https://www.iu.edu/covid/index.html>.
- We will be using a platform, which will be announced in the first weeks of the course, as the main discussion and communication. You can ask questions or share your comments on others questions. You will be receiving regarding updates soon.
- The head assistant of this section is **Pavan Sai Ganesh Vemulapalli**, whose email is pavemu@iu.edu. For any issue you may need to communicate, please first contact with him. He will be coordinating necessary actions for your case. During all communications, please consider the number of students in the class and allow us enough time to response.

Lec.#	Date	Topic
1	August 22, Tue.	Introduction
2	August 24, Thu.	Algorithm Analysis and Asymptotic Notation – I
3	August 29, Tue.	Algorithm Analysis and Asymptotic Notation – II
4	August 31, Thu.	Review of basics – I: Computer architecture, arrays, linked list
5	September 5, Tue.	Review of basics – II: Skip list, stack, queue
6	September 7, Thu.	Review of basics – III: Tree and related data structures
7	September 12, Tue.	Amortized Analysis – I
8	September 14, Thu.	Amortized Analysis – II
–	September 19, Tue.	EXAM-I covering lectures 2,3,4,5,6
9	September 21, Thu.	Recursions
10	September 26, Tue.	Divide&Conquer Paradigm
11	September 28, Thu.	Dynamic Programming – I
12	October 3, Tue.	Dynamic Programming – II
13	October 5, Thu.	Priority Queues and Heaps
–	October 10, Tue.	EXAM-II covering lectures 7,8,9,10,11,12
–	October 12, Thu.	Miscellaneous topic: Data Compression
14	October 17, Tue.	Huffman Coding
15	October 19, Thu.	Sorting & Selection – I
16	October 24, Tue.	Sorting & Selection – II
17	October 26, Thu.	Greedy Algorithm Design
18	October 31, Tue.	Graphs – I
19	November 2, Thu.	Graphs–II
19	November 7, Tue.	EXAM-III covering lectures 13,14,15,16,17,18,19
20	November 9, Thu.	Randomized Algorithms – I
21	November 14, Tue.	Randomized Algorithms – II
22	November 16, Thu.	Hashing – I
–	November 21, Tue.	THANKS GIVING, NO CLASSES
–	November 23, Thu.	THANKS GIVING, NO CLASSES
23	November 28, Tue.	Hashing – II
24	November 30, Thu.	Streaming Algorithms – I
25	December 5, Tue.	Streaming Algorithms – II
–	December 7, Thu.	EXAM-IV covering lectures 20,21,22,23,24,25