

Algorithms II (CS345)

Semester I, 2024-25

29th July 2024

Course Logistics

- Instructor:
Raghunath Tewari
Room No. 514 RM Building
email: rtewari@cse.iitk.ac.in
- Lecture coordinates: MWF 9 – 10am, RM101
- Course Textbook:
 - *Introduction to Algorithms*, by Cormen, Leiserson, Rivest and Stein.
 - *Algorithm Design*, by Kleinberg and Tardos.
- Course Webpage: moodle.cse.iitk.ac.in

Course Syllabus

1. Divide and conquer. Advanced applications.
2. More applications of binary search trees. Orthogonal range searching. Interval trees.
3. Greedy algorithms. More applications.
4. Shortest path problem with positive weights (Dijkstra's algorithm).
5. Revisiting DFS. Advanced applications of DFS.
6. Dynamic programming and its applications.
7. Shortest path with negative weights (Bellman-Ford algorithm). All pair shortest path problem (Floyd-Warshall algorithm).
8. Network flows. Ford-Fulkerson algorithm. Max flow min cut theorem. Variants and applications of max flow.
9. Amortized analysis and its applications.
10. Pattern matching (Knuth-Morris-Pratt algorithm)

11. Binomial heaps, Fibonacci heaps.
12. Finding median using small space.
13. Stable marriage problem (Gale-Shapely algorithm).
14. Polytime reductions.
15. The class NP. NP-completeness.
16. Introduction to approximation algorithms. Examples.

Testing and Grading

Grading will be based on attendance, homework assignments, quizzes, a mid semester exam and a final exam. The following table gives a guideline for evaluating your final grade.

Course Component	Weightage
Attendance	5%
Assignments	5%
Quizzes	25%
Mid Semester Exam	25%
Final Exam	40%

Other Important Information

- Attendance policy for this course is as follows. You are permitted to miss a maximum of 2 lectures during the course without any penalty and without any genuine reason. If you miss between 3 and 7 lectures, you will be awarded 3 out of 5 in attendance. If you miss 8 or more lectures, you will be awarded 0 out of 5 in attendance. If you miss more than 2 lectures, then you must be able to give a strong justification for it such as serious medical condition or family emergency (proof such as medical certificate, travel tickets, etc will be required). Whether your reason is acceptable or not is solely upon the discretion of the instructor. Therefore it is strongly encouraged that you attend all lectures.
- The attendance record for each month will be uploaded on moodle.
- There will be 3-4 assignments in this course. Not all problems from the assignments will be graded. However it is strongly recommended that you solve all assignment irrespective of whether it will be graded or not. For each assignment you will be given about 10 days to complete it. You are required to upload your submissions on moodle. Late submissions are strongly discouraged and will be penalised.
- There will be around 2 quizzes in this course.
- There will be NO makeup quizzes/exams unless under extreme circumstances, which is solely upon the discretion of the instructor.

- Plagiarism in any form such as cheating, copying, lending your work to others, etc., is very strongly discouraged and will be heavily penalised.
- Clarity and legibility of your solutions are as important as the solution itself.
- All course information will be conveyed via the course mailing list. Please make sure you check your email regularly.