Implementation of Advanced Data Structures and Algorithms

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• Course Objectives

- Strengthen knowledge of data structures and algorithms
- Design data structures and algorithms based on requirements
- Evaluate performance of DS&A empirically
- Learn new data structures and algorithms
- Improve problem solving skills
- Improve programming skills
- Improve communication skills

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• You will enjoy the class if you ...

- Love programming
- Enjoy problem solving
- Appreciate the importance of the proper use of data structures
- Want to strengthen your knowledge of DS&A
- Want to improve your interviewing skills

• Knowledge you should already have

Standard data structures, such as, lists, stacks, queues, trees, priority queues, search trees, hashing, graphs

Common algorithms for sorting and searching

Algorithm design paradigms: divide and conquer, dynamic programming

Fundamental graph algorithms: DFS, BFS, Minimum spanning trees, Shortest paths

Programming skills in Java, C++, or Python

- Your grade will depend on:

- Scores in projects, lots of them
- Excellence credits in long projects
- Performance in exams (quizzes, final exam)
- Participation in class and elearning forum

- Projects

Many programming projects will be assigned (Implementation of DS&A, Empirical study of performance of DS&A)

Study project description carefully, especially input/output specifications. Each project may have a starting code base and acceptable reference resources.

Projects are classified into short and long projects. Short projects are assigned weekly. Solve at least one each week. Long projects have 2 deadlines, and they allow you to earn excellence credits. Submit before the 1st deadline to be eligible for excellence credits.

Long projects will be assigned with sample inputs and outputs. But you should create test cases on your own, trying to cover all cases.

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- Short Projects

Several projects will be assigned each week (most Wednesdays). They are due in 1 week. Solve at least one of the problems assigned each week.

Solve and submit as many as you can. You are encouraged to solve all of them each week. 10 points for first solution, and 1 point for each additional problem solved.

Short projects do not carry excellence credits.

No late submissions will be graded (without prior approval). You can submit revised or additional solutions before the deadline.

Only the final submission will be graded. If submitting additional solutions, include all problems solved that week.

- Long projects

Challenging tasks, with longer deadlines (usually 2-4 weeks).

Algorithms needed for the projects are taught in class (or sometimes, you may have to learn from external resources).

Each project will have excellence credits ranging from 0 to 1.

Each project has 2 deadlines. Best projects will earn excellent credits, if submitted before the 1st deadline.

Projects submitted before the 2nd deadline will be graded without any penalties, but they will not earn excellence credits.

Project with lowest score will not be used in grading calculations.

• Groups

Projects can be done in groups of 2 or 4 students. If you have formed your own group, submit the group registration form, with names of all students in the group.

Other students will be organized into groups by the instructor.

Each group will work together on all projects, until the end of the semester. Any requests to change groups have to approved by the instructor. Seek help from instructor if you are unable to resolve problems within a group.

Excellence credit for a project is split among members of the team as follows: groups of size 2: excellence credit awarded to a project (say, 0.8) will be for both students (0.8 each). For groups of size 4, each student in the group will receive 0.9 times the credits awarded to the project.

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• Grading of projects

Projects will be evaluated by (manual) code review and by executing them on (large) test cases.

Students are expected to follow good software engineering practices, and write high-quality code.

Each long project should also be accompanied by a well-written report (txt, pdf, doc) that summarizes results, cites sources.

Projects may be penalized for poorly written code or report, even if there are no explicit guidelines in the specification of a project.

At the discretion of the instructor or TA, you may be asked to come and show a demo of the project.

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• Making an “A”

Earn at least 3 excellence credits.

Get at least 5 participation credits (by participating in discussions in the class forum on elearning).

Score an average of 85% or more in the (weighted) aggregate of all exams: quizzes, final exam.

Score 90% or more in short projects.

Score 90% or more in long projects (after discarding lowest score).

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• Attendance

You are encouraged to attend all classes and actively participate in all discussions (in class and in the online forum on elearning).

Those with perfect attendance will receive 2 participation credits.

If you need to miss a class with a valid excuse (illness, work travel, conference, interview), send email to instructor at least one day before class, asking to be marked as “excused” for that day.

Quizzes will be held in some classes (unannounced). No makeup quiz given to anyone who misses a quiz without prior permission.

• Project submissions

All projects must be submitted on elearning.

Deadlines for short projects will be 1:00 PM on Thursdays.
Deadlines for long projects will usually be at 1:59 AM on Mondays.

Each project should be submitted as a single zip or rar file. Do not use other formats like 7z. Include a readme file. Projects submitted as individual files or in other formats will not be graded.

Each submission can be revised (more than once, if needed) before the deadline. Only the final submission before the deadline will be graded. If revising short projects, make sure you have included all solutions of that project in your zip file.

• Do's and don'ts

You may interact and learn from any of these sources:
- Instructor
- Students in our class and the class forum on elearning

You may read and learn from these sources:
- Any textbook on data structures and algorithms
- Lecture notes made available by instructors (world-wide)
- Wikipedia and other web sources

Don't ask for help in writing or debugging your code.

Don't share your code until after the semester is over.

Don't use code from internet (or other) sources that is not explicitly approved in the project description.

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• Honor code

All students are expected to maintain the highest level of academic integrity and honor.

All sources and collaborations must be acknowledged in your project reports.

Code found to be plagiarized (from other students or from web sources) will receive zero credit, and referred to the Dean of students for disciplinary action.

For more information, see the URL:
http://www.utdallas.edu/deanofstudents/maintain/

• Cheating

Cheating in classes makes no sense. Would you pay for a new car and ask the dealer to give you an old one, instead? Would you play a game in which you have 0.01% chance of winning $1, and if you lose, you pay $1M?

Grades that you get, will have small consequences now, and no consequences in the long term. Knowledge and habits you learn, will serve you for life, and take you to great accomplishments.

Things that are worthy in life: knowledge, good quality work, accomplishments, reputation, family, friends. A good reputation takes a lifetime to build, and one act of dishonesty to ruin it.

Don't cheat. Don't help friends cheat.