Analysis of Algorithms CS583
Fall 2024, George Mason University

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Course Overview

1. Analyzes computational resources for important problem types by alternative algorithms and their associated data structures, using mathematically rigorous techniques. Specific algorithms analyzed and improved.

2. This course introduces basic algorithm design and analysis techniques, including asymptotic analysis, data structures for graph algorithms, divide-and-conquer techniques, probabilistic analysis and randomized algorithms, greedy algorithms, dynamic programming approaches, amortized analysis, flow algorithms, NP-hardness, and introduction to approximation algorithms.

3. Classic algorithms are introduced and they are analyzed mathematically and rigorously.

Prerequisites and Textbook

1. The prerequisites of this courses are grades of C or better in CS310, CS330, and MATH125.

2. **Introduction to Algorithms,**, 4th Edition, by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, 2022.
   The book can be downloaded at:
   `https://ebookcentral-proquest-com.mutex.gmu.edu/lib/gmu/detail.action?docID=6925615`

3. For students taking online courses, zybook is suggested. (More information will be posted in the Announcement Section.)

Grading Policy

- ▶ 13 weekly **assignments** (60%) (All assignments are with the same weight 5.) No late assignment will be graded. The lowest score assignment is dropped.
- ▶ A final exam (40%). 5 problems.

1. A: Assignments ≥ 50 and final exam $\in [45, 50]$
2. A-: Assignments ≥ 50 and final exam $\in [40, 44]$
3. B+: Assignments ≥ 50 and final exam $\in [35, 39]$
4. B: Assignments ≥ 50 and final exam $\in [25, 34]$
5. C/F: Assignments ≥ 50 and final exam $\in [0, 24]$
6. B+: Assignments $\in [55, 60]$ (final exam optional)
7. B: Assignments $\in [50, 54]$ (final exam optional)
8. B-: Assignments $\in [40, 49]$ (final exam optional)
9. C: Assignments $\in [30, 39]$ (final exam optional)
10. F: Assignments ≤ 29 (final exam optional)

week	materials	book chapters
1	growth of functions	Chapters 1, 2, 3
3	divide and conquer	Chapter 4
4	probabilistic analysis and randomized algorithms	Chapter 5
5	sorting algorithms and order statistics	Chapters 7, 8, 9
6	dynamic programming	Chapter 14
7	greedy algorithms	Chapter 15
8	amortized analysis	Chapter 16
9	graph algorithms	Chapter 20
10	minimum spanning tree single-source shortest path	Chapter 21 Chapter 22.2-22.5
11	all pairs shortest paths	Chapter 23
12	maximum flows	Chapter 24
13	NP-completeness	Chapter 34
14	approximation algorithms	Chapter 35
15	final exam	December 11, 2024, 9am-12noon

1. Instructor: Fei Li
   - Office hours: 9:00am-11:00am (Monday)
2. TA: TBD

Plagiarism, Academic Integrity & Inclusivity, Diversity, Religious Holiday, Student Privacy

1. All coursework is to be done independently.
2. Plagiarizing the homework will be penalized by maximum negative credit and cheating on the exam will earn you an *F* in the course.
3. See the GMU Honor Code System and Policies at George Mason University Honor Code.
   3.1 `http://oai.gmu.edu/the-mason-honor-code2/plagiarism/understanding-plagiarism/`
   3.2 `http://oai.gmu.edu/`
   3.3 `http://ulife.gmu.edu/calendar/religious-holiday-calendar/`
   3.4 `https://registrar.gmu.edu/students/privacy/`

Academic Honesty

This course will be conducted in accordance with the GMU Honor Code, and all students are expected to abide by it. The GMU Honor Code, as found in the University Catalog, is as follows:

To promote a stronger sense of mutual responsibility, respect, trust, and fairness among all members of the George Mason University community and with the desire for greater academic and personal achievement, we, the student members of the university community, have set forth this honor code: Student members of the George Mason University community pledge not to cheat, plagiarize, steal, or lie in matters related to academic work. http://oai.gmu.edu/the-masonhonor-code-2/. You may find the honor code for School of Engineering on the Blackboard course menu.

Academic Honesty

Any form of cheating on an activity, project, or exam will result in zero points earned. "Cheating" includes, but is not limited to, the following: looking at others' exam papers, having ANY paper visible (including under your seat) when not allowed, having ANY electronic device visible (including electronic devices in or on your ear), talking with another student during an individual assignment. If you have questions about when the contributions of others to your work must be acknowledged and appropriate ways to cite those contributions, please talk with the professor or utilize the GMU writing center.

Plagiarism and the Internet

Copyright rules also apply to users of the Internet who cite from Internet sources. Information and graphics accessed electronically must also be cited, giving credit to the sources. This material includes but is not limited to e-mail (don't cite or forward someone else's e-mail without permission), newsgroup material, information from Web sites, including graphics. Even if you give credit, you must get permission from the original source to put any graphic that you did not create on your web page. Shareware graphics are not free. Freeware clipart is available for you to freely use. If the material does not say "free," assume it is not. Putting someone else's Internet material on your web page is stealing intellectual property. Making links to a site is, at this time, okay, but getting permission is strongly advised, since many Web sites have their own requirements for linking to their material.
`http://oai.gmu.edu/the-mason-honor-code2/plagiarism/`
`understanding-plagiarism/`

Academic Integrity & Inclusivity

This course embodies the perspective that we all have differing perspectives and ideas and we each deserve the opportunity to share our thoughts. Therefore, we will conduct our discussions with respect for those differences. That means, we each have the freedom to express our ideas, but we should also do so keeping in mind that our colleagues deserve to hear differing thoughts in a respectful manner, i.e. we may disagree without being disagreeable. http://oai.gmu.edu/

On ChatGPT

ChatGPT or other Generative-AI models may not be used in this course as an assistant in projects and homework assignments unless otherwise specifically stated by the instructor.

Risk accompanies use of any powerful tool. Students are cautioned that sharing their own original ideas with Generative-AI models can lead to loss of control and ownership of those ideas and coding. Furthermore, in terms of learning in this class, students who replace their own learning and project work with materials prepared by Generative-AI models:

1. Surrender control over the material's truthfulness and accuracy, and violate the university's Honor Code.
2. Sacrifice the opportunity to acquire the knowledge, skills, and critical thinking taught in the course.
3. Risk being unable to perform to expectations when Generative-AI models are unavailable, such as in exams.
4. Ultimately endanger their employability if they are unable to produce work other than that produced by Generative-AI models.

Diversity, Religious Holiday

Please refer to George Mason University's calendar of religious holidays and observations (http://ulife.gmu.edu/calendar/religious-holiday-calendar/). It is the student's responsibility to speak to the instructor in advance should their religious observances impact their participation in class activities and assignments.

Student Privacy Policy

George Mason University strives to fully comply with FERPA by protecting the privacy of student records and judiciously evaluating requests for release of information from those records. Please see George Mason University's student privacy policy `https://registrar.gmu.edu/students/privacy/`

Disability Statement

If you have a learning or physical difference that may affect your academic work, you will need to furnish appropriate documentation to the Disability Resource Center. If you qualify for accommodation, the DRC staff will give you a form detailing appropriate accommodations for your instructor.
In addition to providing your professors with the appropriate form, please take the initiative to discuss accommodation with them at the beginning of the semester and as needed during the term.
Because of the range of learning differences, faculty members need to learn from you the most effective ways to assist you. If you have contacted the Disability Resource Center and are waiting to hear from a counselor, please tell me.