CSE 548 Graduate Analysis of Algorithms Lecture 1

Course Procedures

Lecturer: Michael Bender *Scribe: Michael A. Bender*

1 Times and Locations

- Lectures: Tuesday and Thursday, 11:00AM–12:20PM in NCS 120.
- Recitation (mandatory): Tuesday 12:30PM–1:25PM in NCS 120.
  (I mix recitation and lecture activities, so Tuesday isn't really different from Thursday except that it is longer.)
- Prof Office Hours:
  To be posted on Brightspace and website.
- TAs:
  To be posted on Brightspace.
- TA Office Hours:
  To be posted on Brightspace.

2 Logistics

We will hold lectures in person.

- We will take photos of everything that I write on the chalkboard.
- You may want to purchase a tablet with a pen (e.g., an iPad and Apple pencil) to help you collaborate with others online (if you want to). You can use software such as Vibeboard `https://app.vibe.us/`.

3 Goals of Class

- Learn a toolbox of algorithmic techniques to solve problems in system design, programming, daily life, and theory.
- Learn how to write proofs of correctness.
- Learn how to design algorithms having performance guarantees.
- Learn theory that is useful to both theoreticians and system builders.
- Learn algorithmic ways of modeling computer systems.
- Appreciate beauty in algorithms.

- Improve your mathematical skills.
- Learn techniques for succeeding as a computer scientist, student, and researcher.
- Become smarter. ☺

Description from Course Bulletin

Algorithmic design and analysis for Computer Science Honors students. Mathematical analysis of a variety of computer algorithms including searching, sorting, matrix multiplication, fast Fourier transform, and graph algorithms. Time and space complexity. Upper-bound, lower-bound, and average-case analysis. Randomization. Introduction to NP completeness. Some machine computation is required for the implementation and comparison of algorithms.

Prerequisites: CSE 150 or CSE 215 or MAT 200 or MAT 250; AMS 210 or MAT 211; CSE 214 or CSE 260; Honors in Computer Science or the Honors College or the WISE Honors Program or University Scholars or Simons STEM Scholars.

3 credits.

4 How to Do Well in This Class

- *Learn the mathematical foundations/basics thoroughly.* We will give study guides and homeworks to guide your studying. On one hand, the mathematical foundations are primarily high school math. But you have to be much faster at it.
- Study. The material requires effort to digest.
- Do all the problem sets seriously.
- Go over lectures and lecture photos several times. (E.g., recopy your notes.)
- Best way to study for exams: Redo *all* the old problem sets and old exams *from scratch*.
- Work with a partner. Work in a group.
- Don't get lost. If you are having trouble or falling behind, please come see me.
- Come to office hours.
- Start the homework early.
- When you don't understand something, ask questions in class immediately.
- Participate. If you aren't saying enough wrong things in class, you aren't participating enough.

5 Prerequisites

- Mathematical maturity.
- Some programming background.

6 Requirements

- One final.
- One midterm.
- 5-7 problem sets. (Every 1-2 weeks.)
- Practice problems.

7 Problem Sets

- Do problem sets in latex.
- Put an example/picture for each problem.
- Hand in both the PDF and a tarball/zipfile of the source. Hand in problem sets electronically.
- It is your responsibility to keep copies of all work that you hand in.
- Late assignments will not be accepted.
- If you work with people or have *any* other sources, you *must* cite them.

8 Possible Small Amount of Extra Credit

- Scribing.
- Suggesting exam problems.

9 Homework Procedures

- Cite everyone that you work with.
- You must write up all your solutions yourself.
- You can share ideas, but it is academically dishonest to share any part of your writeup.
- It is academically dishonest to get your solution from any other student's writeup.
- Don't try to Google solutions. It's not worth it. You may obtain the answer but you won't learn very much. You will get seriously burned if you are caught plagiarizing.
- If you learn the answer to one of your problems from a book or from the web, then you must cite. You will get burned if you search for answers on the web, rather than trying to solve them.
- For more details, see the assignment on academic dishonesty.

10 Grading

- Homework will be worth approximately 15% of the grade, the midterm will be worth approximately 35% of your grade, and final will be worth approximately 50% of your grade. I reserve the right to adjust this formula for generating raw scores by a small amount (e.g., 5%-7%).
- You get 25% of any question in an exam by saying I don't know.
- As mentioned earlier, there may be minor opportunities for extra credit (e.g., scribing).

11 Dates

- The midterm will most likely be on some time late March or early April on a Tuesday. We will discuss these options in class so that we can avoid conflicts with other classes' midterms as much as possible.
- The exam schedule is here: `http://www.stonybrook.edu/commcms/registrar/registration/exams.php`. According to this website, our exam takes place on Tuesday, May 13, 2025, from 11:15AM -1:45PM.

12 Books

There is no single textbook for this course. Recommended textbooks include:

- Introduction to Algorithms, Third Edition by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein.
- Algorithms by Sanjoy Dasgupta, Christos H. Papadimitriou, and Umesh Vazirani.
- Algorithm Design by Jon Kleinberg and Éva Tardos.
- The Algorithm Design Manual by Steven Skiena.
- MIT Open Courseware Introduction to Algorithms 6.046J/18.401J.
- Notes from previous years that I taught the course.

You can also look at other online courses for extra material.

13 Scribing

If students want to scribe lectures and/or practice problems in latex, please let me know. You will get some extra credit for the scribing, but not enough to make it worthwhile just for the grade. It's worthwhile because of the experience doing technical writing.

14 Practice Problems

These may be extra examples based on each lecture. The point is to give extra examples to work through, so that if you understand the examples, then you know that you understand the lecture. After each lecture, we can spend class time trying to come up with these problems together. If the class likes finding these problems, we can find more of them. If not, we will have fewer of them. This doesn't work unless students from class drive the process of nailing down the problems.

15 Student Accessibility Support Center

If you have a physical, psychological, medical, or learning disability that may impact your course work, please contact the Student Accessibility Support Center, Stony Brook Union Suite 107, (631) 632-6748, or at `sasc@stonybrook.edu`. They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential.

Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and the Student Accessibility Support Center. For procedures and information go to the following website: `https://ehs.stonybrook.edu//programs/fire-safety/emergency-evacuation/evacuation-guide-disabilities` and search Fire Safety and Evacuation and Disabilities.

16 Academic Integrity

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty is required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Professions, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty please refer to the academic judiciary website at `http://www.stonybrook.edu/commcms/academic_integrity/index.html`.

I take academic integrity *very* seriously. Infractions have serious consequences. It is *your* responsibility to ensure that you understand what constitutes academic dishonesty.

See the academic honesty assignment for more details.

17 Critical Incident Management

Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Student Conduct and Community Standards any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures. Further information about most academic matters can be found in the Undergraduate Bulletin, the Undergraduate Class Schedule, and the Faculty-Employee Handbook.