

CSE 541T - Advanced Algorithms

Lectures: TuTh 8:30 - 10:00 in Hillman, Room 70

Instructor: Sanjoy Baruah (baruah@wustl.edu). **Office:** Jolley 402. **Office Hours:** TuTh 10:10 - noon, or by appointment

Course Description: This course provides a broad coverage of (i) concepts, notation, and terminology for reasoning quantitatively about the efficiency of algorithms; (ii) important data-structures and algorithms; and (iii) fundamental design techniques for developing efficient algorithms. There is an emphasis on correctness proofs and the ability to apply the techniques taught to design efficient algorithms for problems from a wide variety of application areas.

Prerequisites: CSE 247 (Data Structures and Algorithms) and CSE 347 (Analysis of Algorithms).

Course web page: Located at

<https://research.engineering.wustl.edu/~baruah/TEACHING/2018-1Sp/>.

Students are required to monitor this page frequently for announcements, assignments, lecture notes, etc.

Text: There is one **required** textbook for this course:

- Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein. *Introduction to Algorithms*, Third Edition. MIT Press.

Graded components:

- Several homework assignments. You are permitted to work on these assignments in small groups of at most three participants, but must construct and write up your final solutions independently. Copying homework solutions from another student, the Internet, or other sources is considered cheating. *You must include a signed honor statement with each submission explicitly listing the people you worked with and stating that you completed the assignment in accordance with these rules.* Assignments must be turned in electronically using Blackboard. You may compose them electronically (preferred) or scan handwritten solutions, provided they are legible. Poorly written homework submissions will not be graded.

A homework assignment will typically comprise several problems, all of which may not be graded. It will not be revealed beforehand which problems are being graded.

All assignments must be turned in by the due date; unless previously authorized by the instructor, late assignments will not be accepted.

- Several closed-book exams will be administered in class, testing your knowledge of the material being covered in the lectures and the homework assignments.
- Although attendance will generally not be recorded, it is expected that each student will attend most lectures. The instructor may conduct pop quizzes for extra credit during any lecture, including on days with low attendance.

Grading criteria: The breakup of grades is tentatively set as follows

- Several homework assignments: 40%
- Several (tentatively, three) in-class exams: 60%

Tests and homeworks are graded by the TAs under the instructor's supervision. If you wish to dispute the score assigned to you, it is your responsibility to initiate negotiation via email on this, within one week of the date that the tests or assignments are returned. No complaints will be considered after this one-week deadline.

TOPICS TO BE COVERED (subject to change)

- 1) Introduction: techniques and terminology for the analysis of algorithms
- 2) Algorithm design technique: Divide and conquer
- 3) Algorithm design technique: Dynamic Programming
- 4) Algorithm design technique: the Greedy Method
- 5) Algorithm design technique: randomization
- 6) Intractability: The theory of NP-Completeness
- 7) Approximation algorithms
- 8) On-line algorithms

Disclaimer: The professor reserves the right to make changes to the syllabus, including test dates after they are announced. These changes will be announced as early as possible.

ADDITIONAL INFORMATION

Class Etiquette: You are expected to maintain proper etiquette in class. This includes:

- Not making a habit of arriving late, or leaving in the midst of class. If you must be late once or twice, take an aisle seat quietly; likewise if you must leave early. If this becomes habitual, you should drop the course.
- Keeping cell-phones, pagers, etc. off during class. Not talking in class. Private discussion between students, even whispers, carry surprisingly well and are a real distraction to those seating near you and to the instructor.
- Not using your laptop to browse the web

We will try to be courteous to you and we ask that you be courteous to others as well. Thank you.

Ethics/ violations of academic integrity. Ethical behavior is an essential component of learning and scholarship. Students are expected to understand, and adhere to, the University's academic integrity policy: wustl.edu/policies/undergraduate-academic-integrity.html. Students who violate this policy will be referred to the Academic Integrity Policy Committee. Penalties for violating the policy will be determined by the Academic Integrity Policy committee, and can include failure of the assignment, failure of the course, suspension or expulsion from the University.

If you have any doubts about what constitutes a violation of the Academic Integrity policy, or any other issue related to academic integrity, please ask the instructor *before* turning in your assignment/ exam.

Disability resources. If you have a disability that requires an accommodation, please speak with instructor and consult the Disability Resource Center at Cornerstone (cornerstone.wustl.edu/). Cornerstone staff will determine appropriate accommodations and will work with your instructor to make sure these are available to you.

Inclusive learning environment statement. The best learning environment — whether in the classroom, studio, laboratory, or fieldwork site — is one in which all members feel respected while being productively challenged. At Washington University in St. Louis, we are dedicated to fostering an inclusive atmosphere, in which all participants can contribute, explore, and challenge their own ideas as well as those of others. Every participant has an active responsibility to foster a climate of intellectual stimulation, openness, and respect for diverse perspectives, questions, personal backgrounds, abilities, and experiences, although instructors bear primary responsibility for its maintenance.

A range of resources is available to those who perceive a learning environment as lacking inclusivity, as defined in the preceding paragraph. If possible, we encourage students to speak directly with their instructor about any suggestions or concerns they have regarding a particular instructional space or situation. Alternatively, students may bring concerns to another trusted advisor or administrator (such as an academic advisor, mentor, department chair, or dean). All classroom participants — including faculty, staff, and students — who observe a bias incident affecting a student may also file a report (whether personally or anonymously) utilizing the online Bias Report and Support System

Accommodations based upon sexual assault. The University is committed to offering reasonable academic accommodations to students who are victims of sexual assault. Students are eligible for accommodation regardless of whether they seek criminal or disciplinary action. Depending on the specific nature of the allegation, such measures may include but are not limited to: implementation of a no-contact order, course/classroom assignment changes, and other academic support services and accommodations. If you need to request such accommodations, please direct your request to Kim Webb (kim_webb@wustl.edu), Director of the Relationship and Sexual Violence Prevention Center. Ms. Webb is a confidential resource; however, requests for accommodations will be shared with the appropriate University administration and faculty. The University will maintain as confidential any accommodations or protective measures provided to an individual student so long as it does not impair the ability to provide such measures.

If a student comes to me to discuss or disclose an instance of sexual assault, sex discrimination, sexual harassment, dating violence, domestic violence or stalking, or if I otherwise observe or become aware of such an allegation, I will keep the information as private as I can, but as a faculty member of Washington University, I am required to immediately report it to my Department Chair or Dean or directly to Ms. Jessica Kennedy, the University's Title IX Director. If you would like to speak with Ms. Kennedy directly, she can be reached at (314) 935-3118, jwkennedy@wustl.edu, or by visiting the Title IX office in Umrath Hall. Additionally, you can report incidents or complaints to the Office of Student Conduct and Community Standards or by contacting WUPD at (314) 935-5555 or your local law enforcement agency.

You can also speak confidentially and learn more about available resources at the Relationship and Sexual Violence Prevention Center by calling (314) 935-8761 or visiting the 4th floor of Seigle Hall.

Bias Reporting. The University has a process through which students, faculty, staff and community members who have experienced or witnessed incidents of bias, prejudice or discrimination against a student can report their experiences to the University's Bias Report and Support System (BRSS) team. See: brss.wustl.edu

Mental Health. Mental Health Services' professional staff members work with students to resolve personal and interpersonal difficulties, many of which can affect the academic experience. These include conflicts with or worry about friends or family, concerns about eating or drinking patterns, and feelings of anxiety and depression. See: shs.wustl.edu/MentalHealth