CS 344: Design and Analysis of Computer Algorithms
(Spring 2023 – Sections 5,6,7,8)

Course Syllabus[*]

1 Course Information

General information

Instructor: Sepehr Assadi – `sepehr.assadi@rutgers.edu` – https://sepehr.assadi.info

Prerequisites: CS 112 Data Structures, CS 206 Introduction to Discrete Structures.

We assume a knowledge of basic concepts of programming and data structures, e.g., lists, stacks, queues, trees, as well as basic mathematics, e.g., elementary calculus, proof by induction, linearity of expectation, permutations, logarithms, and asymptotic notation (i.e. "big-Oh", "big-Omega").

Textbook: *Algorithms*, by Erickson, © Copyright 2019 Jeff Erickson
(the electronic version is freely available at: http://jeffe.cs.illinois.edu/teaching/algorithms).

Homeworks and exams will be solely based on the materials presented in the class – this includes the parts that may not necessarily be directly covered in the textbook.

Website: https://sepehr.assadi.info/courses/cs344-s23/
The webpage will contain updated syllabus information as the semester progresses and a calendar.

There is a **Canvas website** for the course where you can find announcements and lecture notes, submit your homeworks, and check your grades. We will use **Piazza** for online discussions.

Students with disabilities: The students with disabilities are encouraged to discuss with me any appropriate accommodations that we might make on their behalf following the guidelines of the Office of Disability Services[1].

Statement of inclusivity: I am committed to creating a learning environment in which all of my students feel safe and included, regardless of race, ethnicity, religion, gender or sexual orientation. Because we are individuals with varying needs, I rely on your feedback to achieve this goal. I invite you to let me know about what I can stop, start, or continue doing to make sure every one of my students feels valued and can engage actively in our learning community.

Academic integrity: The students are expected to follow Rutgers and CS Department academic integrity policies[2] for all their work in this course.

Mask requirements: In accordance with Rutger's policy, masks must be worn during class meetings; any student not wearing a mask will be asked to leave.

Email policy: Please start the subject of all your emails to course staff with "[CS344S23]" so that they are not lost in our inboxes. It may take up 24 hours (48 hours over the weekends) before you hear back on your emails. Questions directly related to the materials of the course and clarifications about lectures should be posted on Piazza to allow for a more timely response by the entire course staff.

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[*]My guess is that no one ever reads the syllabus, so let us test it this time ...
[1]https://ods.rutgers.edu
[2]Rutgers policy: http://academicintegrity.rutgers.edu/
CS department policy: https://www.cs.rutgers.edu/academics/undergraduate/academic-integrity-policy

Lectures and Recitations

Class	Time	Place
Lectures	Tuesdays and Thursdays 2:00 pm – 3:20 pm	PHY-LH (Busch campus)
Recitation 1	Tuesdays 7:45 pm – 8:40 pm	SEC-209 (Busch campus)
Recitation 2	Thursdays 5:55 pm– 6:50 pm	SEC-207 (Busch campus)
Recitation 3	Tuesdays 3:50 pm– 4:45 pm	SEC-202 (Busch campus)
Recitation 4	Tuesdays 5:55 pm– 6:50 pm	SEC-207 (Busch campus)

Participation in any of the lectures or recitations is **not mandatory**. However, if you decide to participate in the class, I ask you to please be respectful of your fellow students and do not use any electronic devices (cellphones, laptops, tablets) during the lectures, unless you are using a laptop or tablet for note-taking.

Office Hours

The Instructor's office hours are:

Time	Place
Tuesdays 3:00 pm – 4:00 pm	CoRE 310 (Busch campus)
Thursdays 3:00 pm – 4:00pm	CoRE 310 (Busch campus)

The schedule of TAs' office hours will be posted soon on the course webpage.

If you have something to discuss directly with me (e.g., a concern, a question, or a comment), send an email with the subject "[CS344S23] ?" (replace ? with what you like to discuss) to me and we will set up a time for a meeting.

Course Staff

Instructor: Sepehr Assadi   sepehr.assadi@rutgers.edu

TAs: This information will be posted soon.

Graders: This information will be posted soon.

Course Topics

The main goal of this course is to help you further develop your **algorithmic thinking** skill: the art of getting to and rigorously analyzing a solution through clearly specified steps. We follow a certain set of standard topics that will help you on this front. But keep in mind that these topics are a means toward the main goal which is sharpening your algorithmic thinking skill.

The following is a **tentative list** of the topics that we will cover in this course (not necessarily in order).

- **Basics of Algorithm Design (review)**: algorithms, asymptotic analysis, proof of correctness

- **Sorting and Searching**: binary search, comparison sorting, counting sort, median selection

- **Hashing**: hash tables, hash functions

- **Algorithm Design Techniques**: divide and conquer, dynamic programming, greedy algorithms

- **Graph Algorithms**: graph search, minimum spanning trees, shortest paths, network flows

- **Advanced Topics**: intro to NP-hardness, approximation algorithms, exponential-time algorithms

2 Assignments and Grading

Grading

- 25% Quizzes (13 or 14 weekly quizzes for $\sim 2\%$ each)

- 25% Homeworks (5 homeworks for 5% each + a "homework 0" with 2% bonus credit)

- 20% Mid-term exams (2 midterms for 10% each)

- 30% Final exam

- +10% Bonus credit[3] (at the discretion of the Instructor/TAs)

Quizzes

There will be weekly quizzes on Canvas accompanying the lectures in the course. Each quiz will contain several multiple-choice (or similar types of) questions on the topics directly covered in the lectures. You should think of the quizzes as a reminder to follow the course lectures weekly; they are all at the level that if you even briefly review the topics taught in that week, you should be able to answer the quiz in less than 10 minutes. The quizzes are also a way for me to monitor the class progress and engagement as a whole.

- **Timing:** Each quiz will be released on a Thursday evening after the last lecture of the week and is due by 11:59 pm of Monday the week after, before the first lecture of the next week.

- **Format:** Quizzes are held on Canvas and their answers will be released after the deadline. You have an <u>unlimited</u> number of attempts for each quiz and your grade will be the maximum of your attempts.

- Quizzes should be done individually and you are <u>not</u> allowed to discuss these questions with other students in the class.

- **A missed/late quiz draws zero credit.** Exceptions will be made only for exceptional circumstances and you will need to provide a university-issued written verification. **However, we will be dropping the grade of your <u>three</u> lowest-graded quizzes.**

Homeworks

Homeworks are the main assignments in this course and will help you in developing and sharpening your algorithmic thinking skills. They will involve a small number of algorithmic questions for you to solve, as well as mathematical statements to prove. You should think of homeworks as the main way of exercising your skills in this course beyond what is directly taught in the lectures.

- **Timing:** There will be five homeworks and a tentative schedule of release and due dates are available on the course calendar. Homeworks will typically be released on a Tuesday and are due two weeks later by 11:59 pm of Tuesday. Occasionally, a homework may be assigned/due on a different day so please follow the course calendar.

- **Format:** Homeworks will be released on Canvas and should also be turned in on Canvas as **a single pdf file** containing the solutions in order. Moreover, **homeworks must be typeset** and handwritten homeworks will <u>not</u> be graded.

  The (strongly) preferred method for typesetting your homework is to use **LaTeX**. Simple instructions on using LaTeX are available on the course webpage and a template will be released with each homework. The course staff are also available to help you with any question you may have in using LaTeX. This policy has a twofold purpose:

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[3]This part includes the 2% bonus credit of "homework 0".

(i) *For students:* LaTeX (tremendously) helps you in writing clean and well-structured proofs (a clean proof is a necessity for a rigorous proof) as well as editing an already written proof further. Moreover, learning LaTeX is an important life-long skill that will come handy sooner or later.

(ii) *For course staff:* Grading homeworks done in LaTeX is a considerably easier (and much more pleasant) task than handwritten homeworks.

Students that turn in **all their homeworks in LaTeX** (including "homework 0") are given a +5% bonus credit at the end of the semester (note that this is equivalent of an entire homework grade)[4].

– **Regrading:** You can make a regrade request for each of your homeworks **within <u>at most one week</u> after you received your grades for that homework**. To do so, send an email to the Instructor with the subject "[CS344S23] Regrade Request: Homework #?" (replace ? with the actual number). If you request a regrade for a particular question, <u>**all** parts of that question will be regraded</u> (possibly by a different course staff) and further points may potentially be deducted from your homework.

– If you leave a question **completely blank** on a homework, you will receive 25% of the grade for that question. However, you may and will receive zero credit for a completely wrong answer. This policy is only in place to discourage writing a meaningless solution in hopes of receiving a few points.

– You are allowed to discuss the homework problems with other students in the class. **But you must write your solutions <u>independently</u>.** You may also consult all the materials used in this course (notes, textbook, etc.) while writing your solution, but no other resources are allowed.

– **Late homeworks:** You are allowed to **submit <u>two</u> homeworks late, each <u>up to two days</u>** (for instance, if the deadline is on Tuesday 11:59pm, you can submit the homework until Thursday 11:59 pm). You do <u>not</u> need to ask for permission to use your extensions – simply write on the first page of your homework that you are using an extension. You will receive <u>zero credit</u> for any homework submitted after two days passed the deadline or after you have used both your extensions. Exceptions will be made only for exceptional circumstances and you will need to provide a university-issued written verification. **Use your extensions wisely!** It helps to save an extension for the end of the semester. Avoid taking an extension on the first homework.

– **Extra Questions:** Some of the homeworks may contain extra questions titled "Challenge yourself" or "Fun with algorithms". These questions are for students who like to familiarize themselves with the topics taught in the course on a more advanced level and will be significantly more challenging than typical questions or may be rather out of scope of the materials taught in this course. **These questions will not be graded** as part of your regular homework but rather will be considered toward your extra bonus credit in this course, at the very end of the semester.

Mid-Term Exams

There will be two mid-term exams in this course. You should think of these exams as a mix between quizzes and homeworks and a way of both testing your understanding of the course as well as further exercising your algorithmic thinking skill.

– Mid-term exam 1 will tentatively be on Thursday, February 23, and mid-term exam 2 will be on Thursday, April 6. Both exams will be held in the classroom during the regular time of the lecture.

– Mid-term exam 1 will tentatively be from the materials in lectures 1 to 11 and mid-term exam 2 will tentatively be from lectures 12 to 20. Any changes to this plan will be announced well in advance of the exam.

– Similar to the homeworks, leaving a question **completely blank** on an exam also will result in 25% of the grade for that question.

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[4]This +5% includes the +2% points just for "homework 0".

- Both mid-term exams **are closed-book**: no textbooks, electronic devices, or cheat sheets are allowed.

- **A missed exam draws zero credit.** However, emergencies will be considered upon submitting a university-issued written verification to the Instructor.

Final Exam

- The final exam will be held at the end of the semester according to the University schedule.

- Similar to the homeworks, leaving a question **completely blank** on an exam also will result in 25% of the grade for that question.

- The final exam **is closed-book**: no textbooks, electronic devices, or cheat sheets are allowed.

- Further details on the timing and format of the final exam will be released later in the semester.

3   Academic Integrity

The students are expected to follow Rutgers and CS Department academic integrity policies[5] for all their work in this course. Please familiarize yourself with these policies if you have not done so yet. In particular,

- The Rutgers honor pledge will be included on all (major) assessments for you to sign:

   On my honor, I have neither received nor given any unauthorized assistance on this examination (assignment).

- Use of external website resources such as Chegg, ChatGPT, or others to obtain solutions to homework assignments, quizzes, or exams is cheating and a violation of the University Academic Integrity policy. Cheating in the course may result in grade penalties, disciplinary sanctions or educational sanctions. Posting homework assignments, or exams, to external sites without the instructor's permission may be a violation of copyright and may constitute the facilitation of dishonesty, which may result in the same penalties as plain cheating.

- You may <u>not</u> copy your homework solutions from any other student's homework. Note that allowing someone else to copy your solution is just as serious of a violation as copying someone else's solution.

- **This policy will be strictly enforced** and violations will be referred to the office of student conduct[6].

- **There are no exceptions to this policy.** If a homework problem is too hard, start earlier, come to the office hours, check your textbook, ask for help from your Instructor or TAs, or in the worst-case, just do not answer that question — academic dishonesty is *never* the right answer. If you are ever in doubt about what constitutes academic dishonesty, always ask the course staff or on Piazza.

Finally, <u>all</u> the materials released in this course are solely for the students registered in the course and are <u>not</u> to be redistributed outside of this class.

4   Rutgers CS Diversity and Inclusion Statement

Rutgers Computer Science Department is committed to creating a consciously anti-racist, inclusive community that welcomes diversity in various dimensions (e.g., race, national origin, gender, sexuality, disability status, class, or religious beliefs). We will not tolerate micro-aggressions and discrimination that creates a hostile atmosphere in the class and/or threatens the well-being of our students. We will continuously strive

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[5]Rutgers policy: http://academicintegrity.rutgers.edu/
  CS department policy: https://www.cs.rutgers.edu/academics/undergraduate/academic-integrity-policy
[6]http://studentconduct.rutgers.edu/student-conduct-processes/academic-integrity/

to create a safe learning environment that allows for the open exchange of ideas and cherished freedom of speech, while also ensuring equitable opportunities and respect for all of us. Our goal is to maintain an environment where students, staff, and faculty can contribute without the fear of ridicule or intolerant or offensive language.

If you witness or experience racism, discrimination, micro-aggressions, or other offensive behavior, you are encouraged to bring it to the attention to the undergraduate program director and/or the department chair. You can also report it to the Bias Incident Reporting System[7].

5   COVID-19 Protocols

We will follow university guidelines[8] when it comes to COVID-19 protocols. If you are feeling sick, or suspect you may have been exposed to COVID-19, do not come to the class. Arrangements will be made for students who are not able to attend class because of an illness or quarantine.

A Final Remark: *So, how did we test whether the syllabus is read by the students or not? Well, we did not actually! Last year we tried a method that was okay but not particularly successful, so we are going to try something different now. Let's use a direct approach this time:*

At the beginning of your "homework 0" (and only on this homework), add a sentence or two (but definitely not more than a paragraph), suggesting some ways that would have encouraged you to read the syllabus (be as creative as you like). Regardless of your answer, if you include anything meaningful here, you will receive another 2% points from the bonus credit part on top of the bonus credit of homework 0 (so, this way, you will receive 4% out of the total 10% of bonus credit already in the first week of the course!).

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[7]http://inclusion.rutgers.edu/report-bias-incident/
[8]https://coronavirus.rutgers.edu/