

CS58400 - Theory of Computation and Computational Complexity

Spring 2026

Course Information

- Meetings: Tuesday & Thursday, 12:00 PM - 1:15 PM @ LWSN 1106
- CRN: 24074
- Course credit hours: 3
- Prerequisites: CS483 - Theory of Computation or equivalent.

Instructor Information

- Instructor: Wei Zhan
 - Email: weizhan@purdue.edu
 - Office hour: Tuesday, 2:30 PM - 3:30 PM @ DSAI 1100
- TA: Satvinder Singh
 - Email: sing1745@purdue.edu
 - Office hour: TBA

Course Description

This is an introductory graduate level course on the theory of computation. We will briefly introduce the basics of **computability theory** that studies *what can be computed*, and focus more on the **complexity theory** that studies *what can be efficiently computed*. We will come across different computation models and resources including time, space, randomness, parallelization and communication, examine the power of corresponding complexity classes and explore the connections between them.

Resources

The course will be mainly based on the following textbook (draft available online):

- [*Computational Complexity: A Modern Approach*](#), by Sanjeev Arora and Boaz Barak, Cambridge University Press.

More resources available on the [course website](#).

Grading

The grading will be divided into three parts:

- Homework (4 assignments): 40%;
- Midterm exam: 25%;
- Final exam: 35%.

Regular attendance is expected but not mandatory.

Assignment Policies

Submission The homework assignments must be submitted in PDF format and typeset in \LaTeX . Submissions will be made through Brightspace. The solutions have to be mathematically rigorous, but try to be as concise as possible.

Collaboration You are allowed to discuss the problems with anyone, including your classmates, instructors during their office hours, online resources or even AI chat bots (which is discouraged because of reliability issues). However, it is highly recommended that you first attempt the problems alone. The final submission **must** be written by yourself and copying from any source is strictly prohibited. Any help from outside the course **must** be properly cited or acknowledged.

Extension Each assignment will due in three weeks after release, at the midnight of the due date. There will be no extensions outside extraordinary circumstances, in which case you need to inform the instructor before the due date.

Exams

The midterm exam will be taken in class on March 5th. No resources, including books, notes, computers or cellphones, are allowed in the midterm or the final exam.

Academic Integrity

Academic integrity is one of the highest values that Purdue University holds. Individuals are encouraged to alert university officials to potential breaches of this value by either emailing integrity@purdue.edu or by calling 765-494-8778. While information may be submitted anonymously, the more information is submitted the greater the opportunity for the university to investigate the concern. More details are available on the Academic Resources table on your Brightspace homepage.

Accessibility

Purdue University strives to make learning experiences accessible to all participants. If you anticipate or experience physical or academic barriers based on disability, you are encouraged to contact the Disability Resource Center at: drc@purdue.edu or by phone: 765-494-1247, as soon as possible.

If the Disability Resource Center (DRC) has determined reasonable accommodations that you would like to utilize in this class, you must release your Course Accommodation Letter to the instructor. Instructions on sharing your Course Accommodation Letter can be found through [this link](#). Additionally, you are strongly encouraged to contact the instructor as soon as possible to discuss implementation of your accommodations.

Nondiscrimination Statement

Purdue University is committed to maintaining a community that recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her potential. A hyperlink to Purdue's full Nondiscrimination Policy Statement is included in the Academic Resources table on your Brightspace homepage.

Mental Wellness Statement

Purdue University is committed to advancing the mental health and well-being of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of mental health support, services are available. For help, such individuals should contact Counseling and Psychological Services (CAPS) at 765-494-6995 during and after hours, on weekends and holidays, or by going to the CAPS offices in West Lafayette or Indianapolis.