CS 580: Algorithm Design, Analysis, and Implementation
Spring 2025
(Tentative Syllabus)

Lectures	Materials	Assignments
Jan 14	Big-O and Big-Ω	
Jan 16	Heap sort	
Jan 21	Quick sort	Hw1
Jan 23	Selection	
Jan 28	Search Trees	
Jan 30	Dynamic prog. I	Hw2
Feb 4	Dynamic prog. II	
Feb 6	Greedy algorithms I	
Feb 11	Greedy algorithms II	Hw3
Feb 13	Fibonacci heap I	
Feb 18	Fibonacci heap II	
Feb 20	Union-find	Hw4
Feb 25	Graphs, DFS	
Feb 27	Topo sort, BFS	
Mar 4	Min. spanning tree	
Mar 6	Midterm	8:00-9:30 pm, MATH 175
Mar 11	Single source shortest path	
Mar 13	All pairs shortest paths	Hw5
Mar 25	Flow networks	
Mar 27	Maxflow-Mincut	
Apr 1	Linear programming	
Apr 3	Simplex algorithm	
Apr 08	LP Duality	Hw6
Apr 10	Approx. Algo. I	
Apr 15	Approx. Algo. II	
Apr 17	Randomized algorithms	
Apr 22	NP-Completeness I	Hw7
Apr 24	NP-Completeness II	
Apr 29	NP-Completeness III	
May 1	Reviews	
May 5	Final	10:30a–12:30p, Hiler Thtr

Instructor: **Tamal K. Dey**, Room: **LWSN 3183**.
Classes: **TR 1:30–2:45 at RAWL 1062**
Office hours: **Tu 3:00-4:00 pm. or by appointment, see Piazza for link**

Grading Policy: **Home works:** 25% **Midterm:** 35% **Final:** 40%
There will not be any grade components other than the above.
Gradescope entry code: **KZEEV4**

TAs: **Andrew Haas**: haas60@purdue.edu, see Piazza for time and zoom link.

Course materials: Course materials will be posted online from the course web-page:

https://www.cs.purdue.edu/homes/tamaldey/course/580/

There is no required text for the course. However, the following books are recommended and there may be references to certain chapters in these books either for recommended reading or homeworks. You are responsible to get the relevant materials from these books if needed.

- Introduction to Algorithms, T. Cormen, C. Leiserson and R. Rivest, MIT press, McGraw-Hill Book Company.

- Algorithm Design, J. Kleinberg, E. Tardos. Pearson Education.

- Also, see this free online copy of Algorithms by Jeff Erickson,

    http://jeffe.cs.illinois.edu/teaching/algorithms/#book

Homework Assignments: There will be weekly or biweekly problem sets. Assignments will be due at 11:59 PM on the posted deadline. All homeworks will be posted on Gradescope. You are responsible to complete the entire homework assignment. You must turn in a digital copy of your homework assignment on Gradescope. Your solutions should be typed in any text editor you prefer (LaTeX, Word, etc). You will find pointers on LaTeX on the class website. Write your solutions as succinctly as possible while including all the necessary details. Please ask your questions on piazza.com (https://piazza.com/purdue/spring2025/cs58000/info) and answer your colleagues questions if you can.

Class discussion: This term we will be using Piazza for class discussion. The system is highly catered to getting you help fast and efficiently from classmates, the TA, and instructors. Rather than emailing questions to the instructor, we encourage you to post your questions on Piazza. If you have any problems or feedback for the developers, email team@piazza.com.
    Find our class signup link at:

https://piazza.com/purdue/spring2025/cs58000

Collaboration Policy: You may collaborate on your homework with your colleagues from the class, however you must write down the solutions yourself, and you must completely understand any solutions you submit. No other sources are allowed and violations will be penalized according to Purdues integrity policies. Do not copy another students homework and do not allow another student copy your homework. Discussions with other students should be appropriately acknowledged. Turning in a solution that you could not explain to the instructor is considered cheating.

Missing or Late Work: Homework is due at 11:59PM on the given due date. The following penalties apply for late homeworks:

- Late reports turned in within 24 hours of the deadline will receive a 30% penalty.

- Reports turned in more than 24 hours after the deadline will be counted as a zero.

The lowest score over all homeworks will be dropped and there will not be any other exceptions for missing homework.

The score for a missed exam is 0. Exceptions will be made to the above policies in case of serious illness or bereavement. In such cases, a students medical or other documentation for the request should be submitted to the Office of the Dean of Students (ODOS) and, if that Office approves, then it notifies the instructors; be aware that ODOS has, in the past, rejected certain forms of documentation (such as ones that are based on some online medical consultations).

If a student has a planned absence for a class when an exam will be given, the student should make arrangement before the planned absence after talking to the instructor.

Exams: Exams are closed book. However, for each exam you will be allowed to prepare a 3x5 index card with your own notes (3x5 inches, double sided). You may not use calculators, cell phones, smart watches, computers, cameras, radios, televisions, books, Morse code, signals or sign language during exams. Do not look at other students exams or let others see your exam while the exam is in progress. Communicate only with the instructor (or TA) during an exam. Bring your picture ID (driver's license or Purdue student ID) to the exam

Grading: All re-grading of homework and midterm exams must be requested within one week of the day the work is returned to the class. **For one question, there can be at most one regrading.** Note: During a re-grade the entire assignment/exam may be re-evaluated.

Incomplete grade I: A grade of incomplete (I) will be given only in unusual circumstances. To receive such an I grade, a written request must be submitted prior to the week of final exams and approved by the instructor. The written request must describe the circumstances, along with a proposed timeline for completing the course work. Submitting a request does not ensure that an incomplete grade will be granted. If granted, you will be required to fill out and sign an Incomplete Contract form that will be turned in with the course grades. Requests for an incomplete grade, that are made after the above-mentioned deadline, will not be considered.

Scale for assigning letter-grades: We may curve when assigning letter-grades at the end of the semester. We have done it in the past not because we think it is a particularly good practice, but rather in recognition of the fact that students may perform differently in exams from what instructors anticipated.

Academic Integrity

Behavior consistent with cheating, copying, and academic dishonesty is not tolerated. Depending on the severity, this may result in a zero score on the assignment or exam, and could result in a failing grade for the class or even expulsion. Purdue prohibits dishonesty in connection with any University activity. Cheating, plagiarism, or knowingly furnishing false informa-

tion to the University are examples of dishonesty. (Part 5, Section III-B-2-a, University Regulations) Furthermore, the University Senate has stipulated that the commitment of acts of cheating, lying, and deceit in any of their diverse forms (such as the use of substitutes for taking examinations, the use of illegal cribs, plagiarism, and copying during examinations) is dishonest and must not be tolerated. Moreover, knowingly to aid and abet, directly or indirectly, other parties in committing dishonest acts is in itself dishonest. (University Senate Document 7218, December 15, 1972). You are expected to read both Purdues guide to academic integrity (http://www.purdue.edu/purdue/about/integrity_statement.html) and Prof. Genes Spaffords guide (http://spaf.cerias.purdue.edu/integrity.html) as well. You are responsible for understanding their contents and how it applies to this class.

Posting Class Material: Posting material associated with this class (e.g., solutions to homework sets or exams) without the written permission of the instructor is forbidden and may be a violation of copyright.

Purdues Honor Pledge: As a boilermaker pursuing academic excellence, I pledge to be honest and true in all that I do. Accountable together - we are Purdue. https://www.purdue.edu/provost/teachinglearn pledge.html

Attendance

Students are expected to be present for every meeting of the classes in which they are enrolled. Only the instructor can excuse a student from a course requirement or responsibility. When conflicts or absences can be anticipated, such as for many University sponsored activities and religious observations, the student should inform the instructor of the situation as far in advance as possible and plan to make up for missed work.

Grief Absence Policy: Purdue University recognizes that a time of bereavement is very difficult for a student. The University therefore provides the following rights to students facing the loss of a family member through the Grief Absence Policy for Students (GAPS). According to GAPS Policy, students will be excused for funeral leave and given the opportunity to earn equivalent credit and to demonstrate evidence of meeting the learning outcomes for missed assignments or assessments in the event of the death of a member of the students family.

Course Policies

Announcements: Course announcements will be made through the course e-mail list. The e-mail list uses your Purdue e-mail address. You are expected to check this account regularly for information related to the class.

Conduct and Courtesy: Students are expected to maintain a professional and respectful classroom environment. This includes: silencing cellular phones, arriving on time for class, speaking respectfully to others and participating in class discussion. You may use non-disruptive personal electronics for the purpose class participation (e.g., taking notes).

Correspondence with the instructor: The best way to correspond in this class is by emailing the instructor. Please prefix all course-related emails with the string CS-580: to help filter email. The instructor will make every effort to answer promptly (within 48 hours). However, replies could be delayed due to circumstances outside the instructors control. If your question is something that requires elaborate discussion, that is, an email reply will require more than 5 lines of text, it is better to see the instructor during the office hours. Depending on the situation, the meeting could be in-person or online. A zoom link in that case will be given.

Students with Disabilities: Purdue University is required to respond to the needs of the students with disabilities as outlined in both the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990 through the provision of auxiliary aids and services that allow a student with a disability to fully access and participate in the programs, services, and activities at Purdue University. If you have a disability that requires special academic accommodation, please make an appointment to speak with the instructor within the first three (3) weeks of the semester in order to discuss any adjustments.

It is the students responsibility to notify the Disability Resource Center (http://www.purdue.edu/drc) of an impairment/condition that may require accommodations and/or classroom modifications. We cannot arrange special accommodations without confirmation from the Disability Resource Center.

Instructor absence: The instructor may be away for a few classes. There will be a guest instructor for these classes. If we need to reschedule additional classes, we will do so on an as-needed basis. Our plan is to use video lectures to supplement for any missing class periods.

Emergencies: In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances beyond the instructors control. Relevant changes to this course will be posted onto the course website and/or announced via email. You are expected to read your purdue.edu email on a frequent basis. Emergency Preparedness: Emergency notification procedures are based on a simple concept: If you hear an alarm inside, proceed outside. If you hear a siren outside, proceed inside. Indoor Fire Alarms are mean to stop class or research and immediately evacuate the building. Proceed to your Emergency Assembly Area away from building doors. Remain outside until police, fire, or other emergency response personnel provide additional guidance or tell you it is safe to leave. All Hazards Outdoor Emergency Warning sirens mean to immediately seek shelter (Shelter in Place) in a safe location within the closest building. Shelter in place means seeking immediate shelter inside a building or University residence. This course of action may need to be taken during a tornado, a civil disturbance including a shooting or release of hazardous materials in the outside air. Once safely inside, find out more details about the emergency. Remain in place until police, fire, or other emergency response personnel provide additional guidance or tell you it is safe to leave. In both cases, you should seek additional clarifying information by all means possible: Purdue Home page, email alert, TV, radio, etc. Review the Purdue Emergency Warning Notification System multi-communication layers at http://www.purdue.edu/ehps/emergency_preparedness/warning-system.html. Please review the Emergency Response Procedures at
https://www.purdue.edu/emergency_preparedness/flipchart/index.html. Please review the evacuation routes, exit points, emergency assembly area and shelter in place procedures and locations for our building. Video resources include a 20-minute active shooter awareness video that illustrates

what to look for and how to prepare and react to this type of incident. See
http://www.purdue.edu/securepurdue/police/video/

Violent Behavior Policy: Purdue University is committed to providing a safe and secure campus environment for members of the university community. Purdue strives to create an educational environment for students and a work environment for employees that promote educational and career goals. Violent Behavior impedes such goals. Therefore, Violent Behavior is prohibited in or on any University Facility or while participating in any university activity.

CAPS Information: 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 support, services are available. For help, such individuals should contact Counseling and Psychological Services (CAPS) at (765)494-6995 and http://www.purdue.edu/caps/ during and after hours, on weekends and holidays, or through its counselors physically located in the Purdue University Student Health Center (PUSH) during business hours.

Nondiscrimination: Purdue University is committed to maintaining a community which 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 own potential. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life. Purdue University prohibits discrimination against any member of the University community on the basis of race, religion, color, sex, age, national origin or ancestry, marital status, parental status, sexual orientation, disability, or status as a veteran. The University will conduct its programs, services and activities consistent with applicable federal, state and local laws, regulations and orders and in conformance with the procedures and limitations as set forth in Executive Memorandum No. D-1, which provides specific contractual rights and remedies.

Privacy: The Federal Educational Records Privacy Act (FERPA) protects information about students, such as grades. If you apply for a job and wish to use the instructor as a reference, you should tell the instructor beforehand. Otherwise, the instructor cannot say anything about you to a prospective employer who might call.

Changes to the syllabus: This syllabus is subject to change. Updates will be posted and dated on the course website.