# CS 610 (1J1), Data Structures and Algorithms, Fall 2025

September 1, 2025

## 1 Basic Information

**Instructor**: Pan Xu, GITC 4310, pxu@njit.edu. Here is his website: https://sites.google.com/site/panxupi/. Office Hours: By appointment. Please feel free to email me to schedule a meeting. *I am typically in the classroom 30 minutes before each class starts, so you can also use that time to ask me any questions.*

**Teaching Assistant (TA)**: Shivam Manish Sarang, sms323@njit.edu. Feel free to email the TA to schedule an online office hours appointment.

**Class schedule and location**: Thursday, 6:00 PM to 8:50 PM. Location: 101 Hudson Street, Jersey City, NJ. The class is delivered Face-to-Face.

**Course overview**: The course will focus on algorithm design and analysis (not implementations). The first half semester is devoted to standard topics, including sorting algorithms, dynamic programming, and basic algorithm design paradigms such as Divide and Conquer. The second half is for advanced algorithm design and analysis, with topics of approximation and randomized algorithm design and analysis for NP-hard problems such as Vertex Cover and Coverage Maximization.

**Prerequisite**: (CS506 or CS241) and (CS505 or CS114). Students are expected to have good knowledge of discrete mathematics and probability theory.

**Textbooks**: No textbooks are required. Below is a list of useful online references:

- Algorithm Design and Analysis:
  https://www.cs.princeton.edu/~wayne/kleinberg-tardos/
  https://courses.cs.duke.edu/fall08/cps230/Book.pdf

- Approximation Algorithms:
  https://www.designofapproxalgs.com/book.pdf
  https://cs-web.bu.edu/faculty/gacs/papers/approx-alg-notes.pdf
- Randomized Algorithms:
  http://www.cs.yale.edu/homes/aspnes/classes/469/notes.pdf
  https://courses.engr.illinois.edu/cs574/sp2022/lec/old_notes/rand_alg_sp18.pdf

## 2 Course Contents and Schedule

| Dates | Topics |
|---|---|
| W1-2 | Introduction, Asymptotic notations and analysis |
| W3-6[⋆] | Bubble/Merge Sort, and (Deterministic and Randomized) Quick Sort |
| W7-8 | Pricing and LP-Based for Vertex Cover |
| W9 | Midterm |
| W10-11 | MAX-SAT Problem |
| W12-14 | COV-MAX, Greedy and LP-Based (**Class on Tues, Nov 25**) |
| W15 | Review for the Final Exam |

[⋆] No class will be held on October 2 (W5) due to Wellness Day.

There are several components to this course as follows:

1. Instructor lectures.
2. Individual assignments: There are four homework assignments, involving algorithm design, analysis, and implementations.
3. Midterm and final exams.
4. Class participation.

## 3 Submissions and Grading of Assignments

| Items | Grade (% of final grade) | (Post Date, Due Date) |
|---|---|---|
| HW1 | 12.5 | (W2,W4) |
| HW2 | 12.5 | (W6,W8)[‡] |
| HW3 | 12.5 | (W10,W12) |
| HW4 | 12.5 | (W13,W15) |
| Midterm | 20 | W9 |
| Final Exam | 30 | TBD |

[‡] Unless otherwise specified, all homework assignments will be posted and due on Fridays. For HW2, it is due on Sunday of W8 (Oct. 26).

Below are a few important notes.

- **The midterm will take place in the classroom on Thursday of Week 9 (W9), from 6:30 PM to 8:30 PM**, and the final is yet to be determined. *Both midterm and final exams are open book exams, allowing the use of lecture notes.* All students must take the midterm and final exams in person. During the exams, all electronic devices that can connect to the internet, such as laptops, smartwatches, smartphones, and tablets, must be powered off. You may bring a calculator and a traditional watch. For paper exams, please use a pen, not a pencil, to write your answers. If you use a pencil, you won't be able to dispute the grading later.
- 20% late submission penalty will be applied if submitted within 24 hours of the deadline. Beyond that, late submission is not accepted. *Unless otherwise stated, all submissions are due by 11:59 PM (EST) on the designated date.*
- For all HWs, students are required to upload a PDF on Canvas by the deadline. Note that only PDF files are accepted and all students are required to type their solutions. It is strongly encouraged that all students should use LaTeX editors to type their solutions, including all equations and math symbols in a proper way. A very useful online cloud-based LaTeX editor is overleaf: https://www.overleaf.com/, which is free to all NJIT students.
- Grading Scale: A: Top 25%; B+: Top 26-50%; B: Top 51-75%; C+/C/D/F/W: TBD.

## 4 Statement on Academic Integrity

Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf.

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu.