



ALGORITHMS & ANALYSIS

COMP 550-002, Spring 2025
The University of North Carolina at Chapel Hill



COURSE INFORMATION

Credit Hours: 3

Pre or Co-Requisites: COMP 211 and 301; or COMP 410; a grade of C or better is required in all prerequisite courses.

Target Audience: This course is intended for computer science majors, and is required for Computer Science (BS) students.

Meeting Pattern: Tuesdays/Thursdays, 11:00-12:15 PM

Instructional Format: In-person

Classroom or Location: SN014

INSTRUCTOR INFORMATION

Name: Noah A. Brown (he/him)

Email Address: noahbrow@cs.unc.edu

Website: www.noahabrown.org

Office Location: TBD

Office Hours: TBD



COURSE CONTENT

Course Description

The goal of this course is to familiarize students with the field of algorithms. Topics covered will include runtime analysis, common algorithmic problem-solving paradigms, a survey of selected common algorithms and their implications, and the challenges posed by NP-completeness.

Course Textbook

There is no required textbook for this course, however, I strongly recommend ensuring access to: *Introduction to Algorithms* (4th ed.), by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein. (Available for free through UNC's partnership with Ebook Central.) This textbook will be incredibly useful in supplementing your learning.

Course Goals & Student Learning Outcomes (SLOs)

By the end of this course, students should be able to:



- Reason about the asymptotic running time of common algorithms, as well as being able to reason about the running time of their own algorithms
- Recognize appropriate problems for different algorithmic approaches, including greedy algorithms, dynamic programming, and divide and conquer algorithms
- Understand the problems solved by common algorithms, including Quicksort, finding Minimum Spanning Trees, Max-Flow, and more.
- Recognize the challenges NP-complete problems pose, as well as techniques for coping with NP-complete problems.

IDEAs in Action General Education Curriculum

IDEAs in Action Gen Ed: FC-QUANT

Student Learning Outcomes:

1. Summarize, interpret, and present quantitative data in mathematical forms, such as graphs, diagrams, tables, or mathematical text.
2. Develop or compute representations of data using mathematical forms or equations as models, and use statistical methods to assess their validity.
3. Make and evaluate important assumptions in the estimation, modeling, and analysis of data, and recognize the limitations of the results.
4. Apply mathematical concepts, data, procedures, and solutions to make judgments and draw conclusions.
5. Synthesize and present quantitative data to others to explain findings or to provide quantitative evidence in support of a position.

Questions for Students:

1. What is the role of mathematics in organizing and interpreting measurements of the world?
2. How can mathematical models and quantitative analysis be used to summarize or synthesize data into knowledge and predictions?
3. What methodology can we apply to validate or reject mathematical models or to express our degree of confidence in them?



COURSE ASSIGNMENTS & ASSESSMENTS

Assignments

There will be 5-7 assignments over the course of the semester. Assignments will typically be posted every 2-3 weeks, and will be due roughly two weeks from when they are released. Students can collaborate with others at a high level, but should not discuss problem specifics. Each student must submit their own answers to Canvas. Once answers are posted, you may discuss them with other students, but not before.

Exams

There will be two midterm exams, as well as one final exam. Midterm exams will be held tentatively on February 6 and March 27. The final exam will be held on Monday, May 5 from 12:00-3:00 PM. **Please note that this time cannot be changed, under any circumstances.** Exams will be closed-book, and held in-person in our usual meeting room. If you miss the final exam, we will follow [UNC policy](#). If your final exam grade is higher than one or both of your midterm grades, I will replace the lower of the two with your final grade. Thus, the final exam effectively serves as a “makeup” exam if you are to miss one.



Late Work and Grading

Late Work

Students have five “late days” that can be used throughout the semester. Late days must be used in one-day increments, and any assignments submitted once you are out of late days will not be accepted. (Saturdays and Sundays still count as one day each.) I strongly encourage you to aim to submit all assignments on time, so that these late days can be used for emergencies.

Weighting

The weighting of grade scores is as follows:

- Attendance: 5% (bonus)
- Assignments: 50%
- Midterm 1: 15%
- Midterm 2: 15%
- Final: 20%

Students’ lowest assignment grade will be dropped at the end of the semester. Students who attend at least 80% of our meetings will receive the full 5 bonus points for attendance.

Grading Scale

Numeric Grade (%)	Letter Grade
[91.5, 105]	A
[88.5, 91.5)	A-
[85.5, 88.5)	B+
[80.5, 85.5)	B
[77.5, 80.5)	B-
[74.5, 77.5)	C+
[69.5, 74.5)	C
[66.5, 69.5)	C-
[63.5, 66.5)	D+
[58.5, 63.5)	D
[0, 58.5)	F

Table a: Grading Scale Table

The above grading scale will be used as a lower bound for grades. In other words, if your calculated grade falls into a “B”, you will not receive less than a B in the course. However, at the end of the semester, I may lower the required scores to meet each grade threshold based on grade distribution.



COURSE SCHEDULE

Week	Tuesday	Thursday
01/07		Course intro and introduction to algorithms
01/14	Algorithm analysis basics	Asymptotic notation
01/21	Comparing growth rates, proving Big-Oh	Divide-and-conquer
01/28	Recurrences, Master Theorem	Recurrences, Quicksort
02/04	Lower-bounding basics	Midterm Exam 1
02/11	Dynamic programming	Dynamic programming
02/18	Dynamic programming	Dynamic programming
02/25	Greedy algorithms	Greedy algorithms
03/04	Greedy algorithms	Greedy algorithms
03/11	SPRING BREAK	
03/18	Basic graph algorithms	Continuing graph algorithms
03/25	Continuing graph algorithms	Midterm Exam 2
04/01	Intro to P vs. NP	NP-completeness basics
04/08	Proving NP-completeness	Proving NP-completeness
04/15	Approximation algorithms	Approximation algorithms
04/22	Additional Topics*	Exam Review*
05/05	FINAL EXAM: 12PM-3PM	

* These days may instead be used as make-up days, in the event of class cancellations.



POLICY STATEMENTS

Academic Policies

University Class Attendance Policy

University Policy: As stated in the University's [Class Attendance Policy](#), no right or privilege exists that permits a student to be absent from any class meetings, except for these University Approved Absences:

1. Authorized University activities: [University Approved Absence Office \(UAAO\)](#) website provides information and [FAQs for students](#) and [FAQs for faculty](#) related to University Approved Absences
2. Disability/religious observance/pregnancy, as required by law and approved by the [Equal Opportunity and Compliance Office](#) (EOC)
3. Significant health condition and/or personal/family emergency as approved by the [Office of the Dean of Students](#), [Gender Violence Service Coordinators](#), and/or the [Equal Opportunity and Compliance Office](#) (EOC).

Code of Conduct

All students are expected to adhere to University policy and follow the guidelines of the UNC Code of Conduct. Additional information can be found at <https://studentconduct.unc.edu/>.



Artificial Intelligence (AI) Use Policy

You are free to use Artificial Intelligence tools as you see fit for assignments, but you are wholly responsible for understanding the answers they produce. If your answers are incorrect, you will not receive full credit. Furthermore, exams are closed-book, and so it is in your best interest to ensure you are not reliant on these tools.

Syllabus Changes

The instructor reserves the right to make changes to the syllabus including assignment due dates and test dates. These changes will be announced as early as possible.

Services & Student Support Policies

Equal Opportunity and Compliance - Accommodations

[Equal Opportunity and Compliance Accommodations Team](#) ([Accommodations - UNC Equal Opportunity and Compliance](#)) receives requests for accommodations for disability, pregnancy and related conditions, and sincerely held religious beliefs and practices through the University's Policy on Accommodations. EOC Accommodations team determines eligibility and reasonable accommodations consistent with state and federal laws.

Counseling & Psychological Services (CAPS)

UNC-Chapel Hill is strongly committed to addressing the mental health needs of a diverse student body. The [Heels Care Network](#) website is a place to access the many mental health resources at Carolina. CAPS is the primary mental health provider for students, offering timely access to consultation and connection to clinically appropriate services. Go to the [CAPS website](#) or visit their facilities on the third floor of the Campus Health building for an initial evaluation to learn more. Students can also call CAPS 24/7 at 919-966-3658 for immediate assistance.

Title IX Resources

Any student who is impacted by discrimination, harassment, interpersonal (relationship) violence, sexual violence, sexual exploitation, or stalking is encouraged to seek resources on campus or in the community. Reports can be made [online to the EOC](#) or by contacting the [University's Title IX Coordinator](#), Elizabeth Hall, or the [Report and Response Coordinators](#) in the Equal Opportunity and Compliance Office. Please note that I am designated as a Responsible Employee, which means I must report to the EOC any information I receive about the forms of misconduct listed in this paragraph. If you'd like to speak with a confidential resource, those include Counseling and Psychological Services and the [Gender Violence Services Coordinators](#). Additional resources are available at [safe.unc.edu](#).

Policy on Non-Discrimination

The University is committed to providing an inclusive and welcoming environment for all members of our community and to ensuring that educational and employment decisions are based on individuals' abilities and qualifications. Consistent with this principle and applicable laws, the University's [Policy Statement on Non-Discrimination](#) offers access to its educational programs and activities as well as employment terms and conditions without respect to race, color, gender, national origin, age, religion, genetic information, disability, veteran's status, sexual orientation, gender identity or gender expression. Such a policy ensures that only relevant factors are considered, and that equitable and consistent standards of conduct and performance are applied.

If you are experiencing harassment or discrimination, you can seek assistance and file a report through the Report and Response Coordinators (email reportandresponse@unc.edu or see additional contact info at [safe.unc.edu](#)) or the [Equal Opportunity and Compliance Office](#). Please note that I am designated as a Responsible Employee, which means that I must report to the EOC any information I receive about harassment or discrimination. If you'd like to speak with a confidential resource, those include Counseling and Psychological Services and the University's Ombuds Office.

Diversity Statement

I value the perspectives of individuals from all backgrounds reflecting the diversity of our students. I broadly define diversity to include race, gender identity, national origin, ethnicity, religion, social class, age, sexual orientation, political background, and physical and learning ability. I strive to make this classroom an inclusive space for all students. Please let me know if there is anything I can do to improve. I appreciate any suggestions.