SYLLABUS CSC 505 SECTIONS 001/002/601 FALL 2024 (3 CREDIT HOURS) DESIGN AND ANALYSIS OF ALGORITHMS

	When?	Where?
Section 001	MW 4:30-5:45 PM	01103 James B. Hunt Jr. Library
Section 002	MW 6:00-7:15 PM	02124 EB3
Section 601		DE-Online

COURSE DESCRIPTION

This course covers:

- algorithms and data structures for classical problems such as sorting, searching, graph problems (connectivity, shortest paths, minimum spanning trees),
- algorithm design techniques, for example, recurrence, divide and conquer, dynamic programming, greedy choice, and approximation,
- performance analysis: asymptotic bounds for worst-case, best-case, and the average-case, amortized analysis, and lower bounds,
- complexity and NP-completeness.

PREREQUISITES

The class has the following prerequisites:

- calculus and lower-level math,
- discrete mathematics, for example, CSC 224/226, or a comparable course,
- data structures, for example, CSC 314/316 or a comparable course, and
- basic programming skills in Python or Java.

LEARNING OUTCOMES

You will learn how to solve computational problems using concepts of algorithms and discrete mathematics, e.g.

- prove the correctness of sorting, selection, graph, and other algorithms,
- compute big-oh, big-omega, big-theta, little-oh, and little-omega bounds for functions,

- analyze the worst and average case running time of algorithms described in pseudocode,
- prove a lower bound on comparison-based sorting algorithms and distinguish between lower bounds for algorithms and lower bounds for problems,
- describe algorithms and their characteristics, such as worst-case running time, space requirements, etc., in textual form,
- solve problems using algorithm design techniques: greedy, divide and conquer, dynamic programming, graph searching, and the use of data structures,
- solve recurrence relationships related to divide and conquer algorithms,
- reduce an instance of a problem to a smaller instance of the same problem,
- identify problem domains in which theoretical results in algorithm design and analysis have practical applications and derive appropriate models for the practical problems,
- define NP-completeness and outline a proof of NP-completeness of a given decision problem,
- identify properties of problems that lead to efficient algorithms or make them intractable.

TEXTBOOK (REQUIRED)

Introduction to Algorithms by TH Cormen, CE Leiserson, RL Rivest, and C Stein.
Edition: 4th. ISBN-13: 978-0262046305.
Web Link: https://mitpress.mit.edu/9780262046305/introduction-to-algorithms/

The textbook is required.

INSTRUCTOR

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Phone: 919-513-1118
Office Location: 2306 EB2
Office Hours:

- on campus 2306 EB2: Thursday 2:00 PM-3:00 PM, or by appointment
- via Zoom PMI 694 362 4188 by appointment

Teaching Assistants: TBA

COURSE STRUCTURE AND POLICIES

The coursework consists of lectures, readings, homework assignments, and exams.

- Lectures (videos) might depart from our textbook. Some of the material presented might not be available through the lecture notes or textbook. You are responsible for all material presented or discussed in class (videos).
- Class attendance is mandatory. For complete attendance and excused absence policies, please see http://policies.ncsu.edu/regulation/reg-02-20-03.
- No laptops or cell phones are allowed during class.
- Readings will generally be taken from our textbook with possible supplements from the literature.
- We will have open-book online quizzes, two closed-book in-class midterms, and a closed-book in-class final exam.
- Exams might include material from lectures, assignments, and readings.
- During exams, you can use writing utensils, calculators (not programmable!), and scratch paper. No other tools, including cell phones, are allowed.
- There will be four homework assignments. All homework assignments are intended to be individual work.

ELECTRONICALLY HOSTED COURSE COMPONENTS

Students may be required to disclose personally identifiable information to other students in the course via electronic tools like email or web postings. Examples include online discussions of class topics and the posting of student coursework. All students are expected to respect the privacy of each other by not sharing or using such information outside the course.

Electronically hosted components: Online course components include Moodle, Zoom, Panopto, and Piazza. Our Moodle Web site contains information about the syllabus and a tentative timeline. **We will be using Piazza for class discussion.**

- Find our **Piazza signup link** at: https://piazza.com/ncsu/fall2024/csc505

- **Rather than emailing questions to the teaching staff, please post your questions on Piazza.** The system is highly catered to getting you help fast and efficiently from classmates, the TA, and myself.

- **For questions about personal grades or meeting requests, please get in touch with the instructor or the TA via private piazza post.**

- **Do not post solutions to assignments or exams before they have been returned** - this will be considered cheating.

- If you have any problems or feedback for the developers, email team@piazza.com.

GRADING

Grades will be computed with a weighted average using the weights shown below.

	001, 002, 601
final in-class/proctored exam	35%
two in-class/proctored midterm exams (equal weights)	40%
multiple open books/not proctored online quizzes (equal weights, we drop the lowest score)	5%
four homework assignments (equal weights, we drop the lowest score)	20%

This Course uses Standard NCSU Letter Grading.

97 ≤ A+ ≤ 100
93 ≤ A < 97
90 ≤ A- < 93
87 ≤ B+ < 90
83 ≤ B < 87
80 ≤ B- < 83
77 ≤ C+ < 80
73 ≤ C < 77
70 ≤ C- < 73
67 ≤ D+ < 70
63 ≤ D < 67
60 ≤ D- < 63
0 ≤ F < 60

- The final exam score will replace the lowest midterm score if this improves your grade.
- Half of your quiz grade will be awarded for participation; you will receive the other half if you answer more than 50% of the questions.
- **There are no makeup quizzes**; instead, we drop your lowest three scores. No excuses are necessary.
- **There is a one-week time limit for submission of disputes for exams and assignments.** The entire exam or homework may be re-graded, not just the disputed question.
- **There are no makeup homework assignments or exams.** If you are forced to miss an assignment or exam, you must contact the instructor before the deadline, and a university-accepted excuse must be presented. If the excuse is accepted, your final exam score will replace the missed assignment or exam grade.
- Extra credit: there might be extra points in assignments and exams. The bonus points earned in a specific assignment or exam cannot be transferred to other assignments or exams.

- At the end of the class, every student will obtain an increase of x percentage points (the instructor will announce x) in the final grade point average. The purpose of these bonus points is to protect students

who cannot double-check their final exam from grading mistakes. The bonus will be removed if a regrade request is submitted.

HOMEWORK POLICIES

- **All homework assignments are intended to be individual work. Turning in an exam or assignment that is not the student's work is cheating. Copying text, code, or other content from the Internet (or other sources) is plagiarism.** Write all homework solutions from scratch using your own words; paraphrasing answers from other sources is unacceptable even if you cite those sources.
- Any tool/resource must be approved by the instructor and identified and acknowledged clearly in any work turned in; anything else is plagiarism. For more information, please consult the university's Code of Student Conduct.
- We may use plagiarism-detection software tools to review your deliverables. These tools may include iThenticate, MOSS, and others.
- Homework assignments must be submitted in printed form via Moodle before the announced deadline. Please do NOT submit scanned writing or pictures in pdf format; otherwise, points might be deducted. Scanned writing is hard to read, takes longer to grade, and produces gigantic files. Use "UnityID_HW#" as the name of the pdf file, where the current homework number should replace #; write your name and unity ID at the top of your homework on page one. **Please try this out well before the due date to ensure it works.**
- Late Policy: All assignments are due at 9 PM of the due date. Late homework will be accepted only in circumstances that are grounds for excused absence under university policy (policies.ncsu.edu/regulation/reg-02-20-03, item 3). The university provides mechanisms for documenting such reasons (severe illness, death in the family, etc.) described on the website. If possible, arrangements for turning in late homework must be made the day preceding the due date. Unexcused late submissions will result in a 10%/40% point reduction on the first/second day after the due date. No credit will be given for submissions three or more days late.

POLICIES ON INCOMPLETE GRADES

If an extended deadline is not authorized by the Graduate School, an unfinished, incomplete grade will automatically change to an F after either (a) the end of the next regular semester in which the student is enrolled (not including summer sessions) or (b) by the end of 12 months if the student is not enrolled, whichever is shorter. Incompletes that change to F will count as an attempted course on transcripts. The burden of fulfilling an incomplete grade is the responsibility of the student. The university policy on incomplete grades is described at http://policies.ncsu.edu/regulation/reg-02-50-03; additional information for graduate students can be found in the Graduate Administrative Handbook in Section 3.18.F at http://www.fis.ncsu.edu/grad_publicns/handbook/.

REQUIREMENTS FOR AUDITORS

This class cannot be audited.

Students are responsible for reviewing the PRRs which pertain to their course rights and responsibilities. These include http://policies.ncsu.edu/policy/pol-04-25-05 (Equal Opportunity and Non-Discrimination Policy Statement), http://oied.ncsu.edu/oied/policies.php (Office for Institutional Equity and Diversity), http://policies.ncsu.edu/policy/pol-11-35-01 (Code of Student Conduct), and http://policies.ncsu.edu/regulation/reg-02-50-03 (Grades and Grade Point Average).

ACADEMIC INTEGRITY

You are expected to maintain the highest standards of academic integrity. This includes producing original work, properly citing sources, and refraining from plagiarism or cheating. You are required to comply with the university policy on academic integrity found in the Code of Student Conduct; see http://policies.ncsu.edu/policy/pol-11-35-01 for a detailed explanation of academic honesty.

- Every piece of work is required to be completed by you.
- Review the Code of Student Conduct: NCSU POL11.35.01 and the Pack Pledge.
- Violations of academic integrity will be handled following the Student Discipline Procedures (NCSU REG 11.35.02).
- **If an academic integrity violation occurs, you will be assessed a penalty at least as severe as getting a 0 for the whole assignment for which the violation occurred. The case will always be reported to the Office of Student Conduct.**

PACK PLEDGE

Your signature on any test or assignment indicates, "I have neither given nor received unauthorized aid on this test or assignment."

ACCOMMODATIONS FOR DISABILITIES

Reasonable accommodations will be made for students with verifiable disabilities. To take advantage of available accommodations, students must register with the Disability Resource Office at Holmes Hall, Suite 304, Campus Box 7509, 919-515-7653. For more information on NC State's policy on working with students with disabilities, please see the Academic Accommodations for Students with Disabilities Regulation (REG02.20.01) (https://policies.ncsu.edu/regulation/reg-02-20-01/).

NON-DISCRIMINATION POLICY

NC State provides equal opportunity and affirmative action efforts and prohibits all forms of unlawful discrimination, harassment, and retaliation ("Prohibited Conduct") that are based upon a person's race, color, religion, sex (including pregnancy), national origin, age (40 or older), disability, gender identity, genetic information, sexual orientation, or veteran status (individually and collectively, "Protected Status"). Additional information on each Protected Status is included in NCSU

REG 04.25.02 (Discrimination, Harassment and Retaliation Complaint Procedure). NC State's policies and regulations covering discrimination, harassment, and retaliation may be accessed at http://policies.ncsu.edu/policy/pol-04-25-05 or https://oied.ncsu.edu/divweb/. Any person who feels that he or she has been the subject of prohibited discrimination, harassment, or retaliation should contact the Office for Equal Opportunity (OEO) at 919-515-3148.

COURSE SCHEDULE

The Course Schedule, including topics, assignments, and exams, is posted on our Moodle page in a separate file: CSC_505_Fall_2024_Schedule.

This syllabus is subject to change.