When? | Where?
---|---
Section 001 | TuTh 4:30-5:45 PM | Online Delivery
Section 002 | TuTh 6:00-7:15 PM | Online Delivery
Section 601 | | DE-Internet
Section 635 | | DE-Internet

COURSE DESCRIPTION
This course covers
• performance analysis of algorithms: asymptotic bounds for worst case, best case, average case, NP-completeness;
• algorithms and data structures for classical problems such as sorting, searching, graph problems, etc., and
• algorithm design techniques, for example recurrence, divide and conquer, dynamic programming, greedy choice, and approximation.

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,
• reduce an instance of a problem to a smaller instance of the same problem,
• give 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,
• solve recurrence relations related to divide and conquer algorithms,
• identify properties of problems that lead to efficient algorithms or make them intractable,
• solve problems using common algorithm design techniques: greedy, divide and conquer, dynamic programming, graph searching, and the use of efficient data structures,
• describe algorithms and their characteristics such as worst case running time, space requirements, etc. in textual form,
• 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.

TEXTBOOK (REQUIRED)

Introduction to Algorithms by TH Cormen, CE Leiserson, RL Rivest, and C Stein.
Web Link: https://mitpress.mit.edu/books/introduction-algorithms

The textbook is required.

INSTRUCTOR

Steffen Heber
Email: sheber@ncsu.edu
Phone: 919-513-1118
Office Location: 2260 EB2
Office Hours: Wednesday 2:00PM-3:00PM, or by appointment
Online Office Hours: Monday 4:30PM-5:30PM, or by appointment
The class uses a flipped classroom. The coursework consists of video lectures, zoom meetings, readings, homework assignments, and exams.

- Please watch the lecture videos and read the textbook **before** our regular class (zoom) meetings.
- We will use our class meetings for answering questions, practicing how to solve problems, reviewing concepts, and providing additional context.
- 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 lecture videos and zoom meetings.
- Readings will generally be taken from our textbook with possible supplements from the literature.
- We will have regular quizzes, and a final exam.
- All quizzes and exams are closed book exams. However, calculators (not programmable!) are permitted. Sorry, no cell phones are allowed.
- Exams might include material from lectures, assignments, and readings.
- There will be four homework assignments. All homework assignments are intended to be individual work.
- We will monitor your participation in class activities. We will also post some additional participation tasks for DE students.

**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, where relevant to the course. Examples include online discussions of class topics and 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:** Moodle Web site, contains information about syllabus, and tentative timeline. We will be using Piazza for class discussion. Find our class page at: piazza.com/ncsu/fall2020/csc505/home. Rather than emailing questions to the teaching staff, I encourage you to post your questions on Piazza. The system is highly catered to getting you help fast and efficiently from classmates, the TA, and myself. If you have any problems or feedback for the developers, email team@piazza.com. Disclaimer: Do not post solutions to assignments or exams before they have been returned - this will be considered as cheating. For questions about personal grades or requests for meetings please contact the instructor, or the TAs via private post.
Grading

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

<table>
<thead>
<tr>
<th></th>
<th>Sections 001, 002, 601, 635</th>
</tr>
</thead>
<tbody>
<tr>
<td>final exam</td>
<td>35%</td>
</tr>
<tr>
<td>multiple announced quizzes (equal weights)</td>
<td>40%</td>
</tr>
<tr>
<td>four homework assignments (equal weights)</td>
<td>20%</td>
</tr>
<tr>
<td>participation</td>
<td>5%</td>
</tr>
</tbody>
</table>

This Course uses Standard NCSU Letter Grading.

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

- Bad Quiz Forgiveness: your lowest two quiz scores will be dropped.
- There is a one-week time limit for submission of disputes for quizzes, and assignments. The entire quiz, exam or homework may be regraded, and not just the disputed question.
- There are no makeup quizzes or exams. If you are forced to miss a quiz/exam, you need to contact the instructor before the quiz/exam, and a university accepted excuse must be presented. If the excuse is accepted, the score of your final exam will be used to replace the grade of the missed exam.
- Course grades may be curved up, but they will never be curved down.
- Extra credit: there might be extra points in homework assignments, quizzes, and exams. The bonus points earned in a specific assignment or exam cannot be transferred to other assignments or exams.

Homework Policies

- All homework assignments are intended to be individual work. Turning in an exam, or assignment which is not the student’s own work is cheating. Copying of text, code, or other content from the Internet (or other sources) is plagiarism. Write all homework solutions from
scratch using your own words; paraphrases of solutions from other sources are unacceptable even if you cite those sources.

- If an academic integrity violation occurs, the offending student(s) will be assessed a penalty that is at least as severe as getting a 0 for the whole homework for which the violation occurred. The case will always be reported to the Office of Student Conduct.
- Any tool/resource must be approved in advance 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.
- Homework assignments must be submitted in printed form via Moodle before the announced deadline. To avoid reduced marks, please submit word/latex-formatted PDF file, NOT scanned writing in pdf format. Scanned writing is hard to read, takes longer to grade, and produces gigantic files. Use "UnityID_HW##" as a name of pdf file, where # should be replaced by current homework number; 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 make sure that it works for you.
- Late Policy: All assignments are due on 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.); these are described on the web site. Arrangements for turning in late homework must be made by the day preceding the due date if possible. 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 that are 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 located at http://policies.ncsu.edu/regulation/reg-02-50-03. Additional information relative to incomplete grades 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 required to comply with the university policy on academic integrity found in the Code of Student Conduct found at http://policies.ncsu.edu/policy/pol-11-35-01.

**ACADEMIC HONESTY**

See http://policies.ncsu.edu/policy/pol-11-35-01 for a detailed explanation of academic honesty.

**HONOR PLEDGE**

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

**ACCOMMODATIONS FOR DISABILITIES**

*Reasonable accommodations will be made for students with verifiable disabilities. In order 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/](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 as to 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.*

This syllabus is subject to change.