CSE 423/823 Design and Analysis of Algorithms

Spring 2021

General Information

Synchronized Conferencing:
Zoom meeting ID: 928 3248 6295; passcode: 423823
Office hours of instructor and TA will use the same ID.

Instructor:
Juan Cui
Avery Hall, 122E
Phone:402-472-5023
Email: jcui@unl.edu
Office Hours: Tue 11:00-12:00am & Thu 3:30-4:30pm via Zoom

Teaching Assistant:
Maria Salome Perez Rosero <mperezrosero2@huskers.unl.edu>
Office Hours: Fri 9:30 – 11:30 am (or by appointment) via Zoom

Lectures:
Tue/Thu 9:30 am – 10:45 am, meet via Zoom. Lecture slides with audio recording will be posted on Canvas.

Required Text:
Data Mining: Introduction to Algorithms, Third Edition by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, MIT Press, 2009.

Recommended Text:
Introduction to the Theory of Computation, Third Edition by Michael Sipser, Cengage Learning, 2012.
Introduction to the Design and Analysis of Algorithms, Third Edition by Anany Levitin, Pearson, 2011.

Prerequisites:
A grade of "P" or "C" or better in CSCE 310, CSCE 310H, CSCE 311, SOFT 260, SOFT 260H or RAIK 283H

Communication:

A new means of communication for this course is Piazza, an online forum system designed for college courses, in addition to Canvas.

Sign up link: http://piazza.com/unl/spring2021/cse423823

With Piazza you can ask questions anonymously, remain anonymous to your classmates, or choose to be identified. Using this open forum system, the entire class benefits from the instructor and TA responses. In addition, you and other students can also answer each other's questions (again you

may choose to remain anonymous or identify yourself to the instructors or everyone). You may still email the instructor or TAs, but more than likely you will be redirected to Piazza for help. You are encouraged to check in and respond to the questions posed by other students. Extra credit will be given to students who actively participate in this activity, particularly to students who answer the questions posed by a student.

Course Overview

Algorithms for problems such as sorting, graph reachability, matching, etc. are at the heart of almost all real-life computer applications. Efficiency and correctness of these algorithms directly influence the overall efficiency and correctness of the applications that use them. Hence it is important to come up with very fast and correct solutions to these basic computational problems. As the name suggests, this course has mainly two aspects: designing algorithms for basic computational problems and analyzing their correctness and efficiency. These two aspects go hand in hand with each other.

Course Bulletin Description

Mathematical preliminaries. Strategies for algorithm design, including divide-and-conquer, greedy, dynamic programming and backtracking. Mathematical analysis of algorithms. Introduction to NP-Completeness theory, including the classes P and NP, polynomial transformations and NP-complete problems.

Course Learning Objectives

At the end of this course, students will be able to:

- Understand main concepts of algorithms
- Implement and apply algorithms
- Design and integrate algorithms
- Analyze correctness and complexity of algorithms

Tentative Course Schedule (All Information Subject to Change):

Week	Date (week of)	Topic	Textbook Coverage
1	1/25	Introduction	n/a
2	2/01	Median and order statistics	Chapter 9
3	2/08	Dynamic programming and Greedy algorithms	Chapter 15 & 16
4	2/15	Elementary graph algorithms	Chapter 22
5	2/22	Minimum span tree	Chapter 23
6	3/01	Single source shortest paths	Chapter 24
7	3/08	Single source shortest paths	Chapter 24
8	3/15	All-pairs shortest paths	Chapter 25

9	3/22	All-pairs shortest paths	Chapter 25
10	3/29	Maximum flow	Chapter 26
11	4/05	Maximum flow	Chapter 26
12	4/12	NP-completeness	Chapter 34
13	4/19	Approximation Algorithms	Chapter 35
14	4/26	Course summary	n/a
Final	Exam 10:00 a.m. to 12:00 p.m. Tuesday, May 4		

Course Elements

Homework

General Guidelines

- *Homework will be assigned and announced. Due date will be clearly stated. Hard copies will not be collected during this semester.*
- *A majority of points will be awarded to the PROCESS of getting to the solution and not on the final answer.*

Format Guidelines

- *Your name should appear on each page.*
- *The pages of your homework (per assignment) must submitted as a single PDF format.*
- *You may include handwriting or pictures as long as they can be assembled into the single PDF file. If you copy and paste some online images or published resources, please refer to the website or resource name to avoid copy right violation.*
- *Poor quality of the document will lead to poor grades if critical steps or answers cannot be recognized. No further argument is allowed.*
- *Final answers must include correct units for full credit when applicable.*

Group Homework Policy

- *You are encouraged to work on your homework assignments in groups, and each student must turn in their homework by themselves or by their teammate (one copy for one team is enough).*
    - *If you do choose to work with a group, the names of the group members should be provided with the homework assignment.*
    - *If you choose to work on your own, please better notify "NO teammates".*
- *Teammates names cannot be added or changed after the homework is submitted and past the deadline. If your name is missed or duplicated and thus your homework becomes invalid, you can still submit a late homework with 50% total points deduction next day.*
- *The team size can be 1-4 students. Each team should consist of only students from CSE 423 or from CSE 823.*
- *The team can be changed dynamically for each homework. You can propose names for future homework, otherwise we can randomly assign.*

Late Homework Policy

- *If a late due date is necessary, permission from the instructor is required.*
- *Late homework will have 50% deducted from the grade per school day.*

- *Under no circumstances will homework assignments be accepted after graded homework has been returned and solutions have been posted on canvas.*
- *Homework turned in late will not always be returned at the same time as the homework turned in on time.*

Quizzes:

Multiple choices or simple questions are provided on Canvas directly. Every student should be responsible to finish it before deadline. The quiz has a time limit.

Exam:

- *See "general guidelines" and "format guidelines" for "homework".*
- *Due date is stricter. No late exam is allowed.*
- *Make-up exams are not always available unless there is a compelling and documented reason that you miss the exam. In absence of sufficient justification for missing an exam, zero will be assigned for that exam. Whenever possible, notify the instructor before you must miss an exam.*

Communication Expectations:

Expectations for Behavior

- *Students are expected to display tolerance and respect in all communication.*
- *For this class to be effective, you must be an active learner.*
- *Students should learn from each other with respect and dignity, in order to benefit from group studies.*

Grading

Grades for the above course elements will be weighted as follows:

Classroom Participation	0%
Homework	30%
Quiz	25%
Mid-term	20%
Final Exam	25%

Grading Scale:

Numerical score or class curved % (whichever is higher)	Letter grade
97-100	A+

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

Attendance Policy

n/a

Accommodations for Students with Disabilities

It is the policy of the University of Nebraska-Lincoln to provide flexible and individualized accommodations to students with documented disabilities that may affect their ability to fully participate in course activities or to meet course requirements. To receive accommodation services, students must be registered with the Services for Students with Disabilities (SSD) office, 232 Canfield Administration, 472- 3787 voice or TTY.

UNL CSE Department Policies

It is CSE Department policy that all students in CSE courses are expected to regularly check their email so they do not miss important announcements.

The CSE Department's Student Resource Center is located in Avery 12: http://cse.unl.edu/src. The office hours by the TAs are held there.

The CSE Department has an anonymous contact form that you may use to voice your concerns about any problems in the course or department if you do not wish to be identified.

Academic Misconduct

All homework assignments, programs, and exams must represent your own work unless otherwise stated. No collaboration with fellow students, past or current, is allowed unless otherwise permitted on specific assignments or problems. The Department of Computer Science & Engineering has an Academic Integrity Policy. All students enrolled in any computer science course are bound by this policy. You are expected to read, understand, and follow this policy. Violations will be dealt with on a case by case basis

Technology Policy

Technology is allowed in class only as it directly supports class learning and announced by professor. General internet surfing, texting, e-mailing, working on other coursework or personal items is not appropriate or acceptable. Out of respect for the class, students are expected to silence or turn off their phones and other notification devices during class and to refrain from texting, calling or using electronics, except as a part of classwork. If any of these behaviors occur during the class meetings the student will be asked to leave the class and will be counted as absent. This is also applicable to online zoom meetings.

Academic Honestly Policy

Student Code of Conduct, Section B. Conduct – rules and regulations, 1. Acts of Academic Dishonesty

Academic integrity is of the utmost importance at Nebraska. Be sure you understand expectations of you and your academic work. View the complete list of academic dishonesty violations in the Student Code of Conduct, specifically Article III: Proscribed Conduct, Section B. Conduct – Rules and Regulations, 1. Acts of Academic Dishonesty. For more information, please visit https://studentconduct.unl.edu/. If you are unsure what counts as academic dishonesty in this course, please visit me during office hours. The first instance of academic dishonesty will result in a score of zero for the assignment or exam. The second incidence of academic dishonesty will result in a failing grade for the course

https://studentconduct.unl.edu/student-code-conduct

Diversity and Inclusion Statement

It is my intent that students from all diverse backgrounds and perspectives be well-served by this course, that students' learning needs be addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength and benefit. I would like to create a learning environment for my students that supports thoughts, perspectives, and experiences, and honors your identities (including gender, sexuality, disability, age, socioeconomic status, ethnicity, race, nationality, religion, culture, etc.). If you have any concerns, please feel free to contact me.

https://diversity.unl.edu/student-resources

Emergency Procedures

City Campus Emergency Information:

Please follow the link below for UNL's Emergency Preparedness Resources. Sign up for the UNL Alert service under the "**Stay Connected**" portion of the web-page.

Fire and Medical Emergencies: 911

University Police: 402-472-2222

Twitter: @NebPrepare

E-Mail: preparedness@unl.edu

https://emergency.unl.edu/

Scott Campus Emergency Information:

A number of resources are available for distributing and receiving critical information and instructions during an emergency.

- All-campus email
- UNO Alert text message and email alerts
- Posts on UNO's official Facebook and Twitter accounts
- Emergency banner on the UNO homepage
- Overhead pages and indicator lights on campus
- Emergency information line (402.554.2255)
- Media outlets

https://www.unomaha.edu/emergency/index.php

Student Resource Information

(please double check, some of them may only have online services at this moment)

Well-Being (Home Campus – Lincoln Campus):

UNL offers a variety of options to students to aid them in dealing with stress and adversity.

- Counseling and Psychological Services (CAPS) is a multidisciplinary team of psychologists and counselors that works collaboratively with Nebraska students to help them explore their feelings and thoughts and learn helpful ways to improve their mental, psychological and emotional well-being when issues arise.
    - CAPS can be reached by calling 402-472-7450.

- Big Red Resilience & Well-Being (BRRWB) provides one-on-one well-being coaching to any student who wants to enhance their well-being. Trained well-being coaches help students create and be grateful for positive experiences, practice resilience and self-compassion, and find support as they need it.
    - BRRWB can be reached by calling 402-472-8770.

Well-Being (Home Campus – Scott Campus):

UNO offers a variety of options to students to aid them in dealing with stress and adversity.

- Counseling and Psychological Services (CAPS) is dedicated to working with students to provide that can assist with challenges that have impacted their overall well-being. These could include adjusting to life events, relationship issues and mental health changes. Counseling staff work closely with Nebraska Medicine Health Services to provide on-campus referrals and collaboration with their services.
    - CAPS can be reached by calling 402-554-2409.

Math Resource Center:

The Mathematics Resource Center (MRC) is a free tutoring service and is the primary facility for undergraduate students who are enrolled in an have questions related to any precalculus or calculus course offered by the department. The Center also provides an excellent location for students to meet and work together on assignments or group projects.

- No appointments or reservations are needed.

- Staffed by Graduate Teaching Assistants and by undergraduate math majors hired for the center.
- Ask for assistance with math courses 100A, 101, 102, 103, 104, 106, 107, and 107H.

https://www.math.unl.edu/resources/undergraduate/mrc

The Writing Center:

At the Writing Center, our undergraduate and graduate Writing Consultants work with writers at all levels, from all disciplines, at all stages of the writing process. All members of the UNL community (students, faculty, and staff) are welcome.

Whether you are brainstorming or organizing ideas or polishing a final draft, we look forward to discussing your writing with you.

All forms of communication are welcome, from essays, lab reports, research papers, and journal articles to presentations, cover letters, personal statements, and theses/dissertations.

https://www.unl.edu/writing

Engineering Study Shop:

The College of Engineering provides FREE walk-in tutoring services for all engineering students! The courses and areas-of-study that the Engineering Study Stop tutors are able to assist with include: Math, Physics, Chemistry, Mechanical Engineering, and a variety of other engineering-related coursework. Click on the button below to meet our tutors and learn more about which courses they are able to assist you with. Study Stop allows you to study with other engineering students and trained tutors to gain more confidence and a better understanding of your course material... No reservations needed!

https://engineering.unl.edu/current-students/study-stop-city-campus/

ADA and Accommodation:

Students with disabilities are encouraged to contact the instructor for a confidential discussion of their individual needs for academic accommodation. It is the policy of the University of Nebraska-Lincoln to provide flexible and individualized accommodation to students with documented disabilities that may affect their ability to fully participate in course activities or to meet course requirements.

To receive accommodation services, students must be registered with the Services for Students

with Disabilities (SSD) office, 232 Canfield Administration, 472-3787 voice or TTY.

Office of Services for Students with Disabilities:

The University of Nebraska-Lincoln is committed to ensuring equal access to curricular and co-curricular opportunities for students with disabilities. Providing a range of services, SSD implements reasonable accommodations for students with disabilities and offers students the opportunity to contribute and participate in the diverse campus experience at the University of Nebraska–Lincoln. This site is intended to provide you with the information you need to enjoy your life as a University of Nebraska student. http://www.unl.edu/ssd/home.