Southern Illinois University
Department of Computer Science
CS 330/491 - Introduction to the Design and Analysis of Algorithms
Semester Hours: 3
SPRING 2024 SYLLABUS

Faculty Information

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TA Office Hours
TBA

Course Information

Course Description

In this course, we will study the design, analysis, and complexity of algorithms. This course is intended to provide an introduction to algorithm analysis and design. It will begin with a discussion on the motivation behind the study of algorithms, the methods used in the analysis of algorithms, and how to show algorithm correctness. Following this extended introduction, algorithm design techniques will be presented. This will include techniques such as brute force, divide/conquer/combine, greedy, dynamic programming, and network flow. The course will conclude with an exploration of computational intractability, including the class of NP-complete problems. A brief overview/review of basic data structures will be provided early in the course. More complex data structures will be introduced as they are needed by the algorithms developed in the course that include graphs and trees.

Catalog Description

A detailed treatment of the design, analysis, and complexity of algorithms, including greedy algorithms, divide and conquer, dynamic programming, and limitations of algorithms as problems get larger or more complex.

Course Prerequisites

CS 220. Good knowledge of data structures (such as linked lists and trees) and a good mathematical background is required.

Course Meeting Days/Times

TR 12:35-1:50 PM, ASA 118

Final Exam

Final exam date/time: TBA.

Course Learning Objectives

On successful completion of CS 330 students should be able to:

- Describe implementation, behavior, and use of selected data structures.

- Describe the algorithm for, characteristics and performance of selected sorting and searching algorithms.

- Identify various algorithm design techniques.

- Analyze algorithms for efficiency and correctness.

- Distinguish among P, NP, and NP-Complete classes.

Course Materials

OPTIONAL: Algorithm Design, by Jon Kleinberg and Eva Tardos. ISBN: 0-321-29535-8.

Course Structure

Course Policies/ Procedures/Grading

Following is a tentative **rough guide** to how course grades will be established, not a precise formula - we will fine-tune cutoffs and other details as we see fit after the end of the course.

Grades will be based on:
    Homework assignments: 40%
    Midterm exam: 30%
    Final exam: 30%

Grading Scale:

93 – 100	A	73 – 76	C
90 – 92	A-	70 – 72	C-
87 – 89	B+	67 – 69	D+
83 – 86	B	60 – 66	D
80 – 82	B-	0 – 59	F
77 – 79	C+		

Course Assignments
   Assessment of students' knowledge of data structures and algorithms will be demonstrated

via:
- A combination of homework assignments, quizzes, and exams.
- Understanding algorithm design techniques, implementation and analysis.
- C++ programming.

For assignment submission please include a typed cover sheet with your name, DAWG tag, homework number and undergraduate/graduate level.

Course Outline/Schedule (Tentative)

I. Revisit Basic Data Structures
    A. Arrays, Lists, Stacks & Queues
    B. Linked Lists
II. Introduction to Algorithms
III. Algorithm Analysis
    A. Asymptotic
    B. Complexity
    C. Correctness
IV. Searching & Sorting
    A. Binary Search
    B. Selection
    C. Insertion
    D. Mergesort
    E. Quicksort
V. Graphs
    A. Connectivity
        1. Undirected, directed, DAGs
    B. Traversal
        1. BFS
        2. DFS
VI. Algorithm Design by Brute Force / Exhaustive Search
VII. Greedy Algorithms
    A. Dijkstra
    B. Prim
    C. Kruskal
VIII. Divide/Conquer/Combine
IX. Dynamic Programming
X. Network Flows
XI. NP & Computational Intractability
XII. Approximation Algorithms

General Expectations:

1.   This is a 3-semester hour course where the class meets for 3 hours in a week. Students are expected to have access to an internet-connected computer, and have the required level of computer skills, motivation and a commitment to work on their assignments. Course activities might include attending lectures, completing assignments, exams, participating in discussion

forums based on prompts from the instructor, and/or responding to questions that have been designed by the instructor to check the understanding of key concepts.

2.   If you require accommodations for test-taking due to a disability, please contact the Disability Support Serviced (https://disabilityservices.siu.edu). Please provide the appropriate accommodation documentation during the first week of the semester. You must also provide a test accommodation form **for each test** in which the accommodation will be required. This documentation should be provided to me at least **one week** prior to the scheduled exam.

3.   All assignments will be given a due date. Students are expected to turn the assignments in by the due date. Late assignments **will not** be graded!!! There will be **no exceptions to this policy**. **Assignments will be submitted to the associated D2L Assignments file which once closed will no longer accept any assignments**.

4.   All projects are expected to be done by the individual, unless otherwise directed. Cheating **will not** be tolerated and will result in a ***failing grade for the class AND referral to Judicial Affairs***. **I will entertain NO excuses for cheating!**

5.   If you are struggling with the material in the class, please make a point to visit me during my office hours or make an appointment to receive additional help. **It is not wise to wait until after midterms to try and "rescue" your grade**. Establishing a tutoring relationship with anyone during the last week of the semester will be impossible and should not be attempted. Additionally, please do not ask to submit all missing homework assignments at semester end – they **must be submitted prior to the due date!**

6.   If you wish to discuss your grade, please make an appointment or come to see me during office hours. I do not discuss grades over email. **DO NOT REQUEST A GRADE CHANGE ONCE THE FINAL IS OVER.**

7.   I will use email to communicate with you about many things outside of the regular class time. It is imperative that you frequently check your email, therefore you **are required** to check your email regularly and I assume that you receive any email message from me within 12 hours of it being sent. Also, please regularly check your spam folder, as sometimes email from me lands there.

Academic Integrity:

It is expected that all work submitted through this course is the student's original work, generated for the express purpose of completing the requirements of this course. All papers submitted in this course may be screened for originality using Turnitin's plagiarism detection software. This software checks submissions for text matches, Web content, books including classic works of literature, and newspapers, magazines and scholarly journals.

Students are to be aware that academic dishonesty is not tolerated in this course and should be familiar with the following definitions:

Cheating. Behaviors including, but not limited to, use of unauthorized notes or reference materials during examinations; copying answers from another student's paper during an examination; the unauthorized possession of academic materials, including exams; the unauthorized exchange of course assessment materials, including exams; the unauthorized exchange of information or collaboration regarding tests, or other course assignments; aiding another to engage in cheating; and/or all other acts of academic dishonesty that any member of this academic community would reasonably understand to be a breach of this academic integrity statement will be considered cheating and an act of academic dishonesty.

Plagiarism. Plagiarism may be defined as the act of taking the ideas and/or expression of ideas of another person and representing them as one's own. This includes, but is not limited to, using ideas or passages from a work without properly attributing the source, paraphrasing the work of another without giving proper credit, and/or the sale, purchase, or exchange of papers or research. It is the student's responsibility to know what plagiarism is and to properly cite the work of others. If a student is in doubt, it is their responsibility to resolve any ambiguity prior to submitting the work. Plagiarism is nothing less than an act of theft, and, as such, is subject to university disciplinary action.

Syllabus Attachment

Spring 2024

IMPORTANT DATES:

Semester Classes Begin: ……………….……………………………**01/16/2024**

Last day to add full-term course (without Dean's signature): …..**01/21/2024**

Last day to withdraw from the University with a full refund: …...**01/26/2024**

Last day to drop a full-term course for a credit/refund: …………..**01/28/2024**

Last day to drop a full-term course (W grade, no refund):………..**03/31/2024**

Final examinations: ……………….……………………**05/06/2024–05/10/2024**

Note: Please verify the above dates with the Registrar calendar and find more detailed information on deadlines at http://registrar.siu.edu/calendars. For add/drop dates that apply to shorter-than-full-term courses, please look at the Schedule of Classes search results at http://registrar.siu.edu/schedclass/index.php

SPRING SEMESTER HOLIDAYS:

Martin Luther King, Jr.'s Birthday 01/15/2024
Spring Break 03/09/24-03/17/24
Total Solar Eclipse (classes cancelled) 04/08/24

DIVERSITY: Southern Illinois University Carbondale's goal is to provide a welcoming campus where all of our students, faculty and staff can study and work in a respectful, positive environment free from racism and intimidation. For more information visit: http://diversity.siu.edu. Additional informational flyer.

DISABILITY SUPPORT SERVICES: SIU Carbondale is committed to providing an inclusive and accessible experience for all students with disabilities. Disability Support Services coordinates the implementation of accommodations. If you think you may be eligible for accommodations but have not yet obtained approval please contact DSS immediately at (618) 453-5738 or https://disabilityservices.siu.edu. You may request accommodations at any time, but timely requests help to insure accommodations are in place when needed. Accommodations and services are determined through an interactive process with students and may involve consideration of specific course design and learning objectives in consultation with faculty.

MILITARY COMMUNITY: There are complexities of being a member of the military community and also a student, and military and veteran related developments can complicate academic life. If you are a member of the military community and in need of accommodations please visit Veterans Services at http://veterans.siu.edu/.

STUDENT MULTICULTURAL RESOURCE CENTER: The Student Multicultural Resource Center serves as a catalyst for inclusion, diversity and innovation. As the Center continues its work, we are here to ensure that you think, grow and succeed. We encourage you to stop by the Center, located in the Student Services Building Room 140, to see the resources available and discover ways you can get involved on the campus. Visit us at https://smrc.siu.edu/.

SALUKI CARES: The purpose of Saluki Cares is to develop, facilitate and coordinate a university-wide program of care and support for students in any type of distress—physical, emotional, financial, or personal. By working closely with faculty, staff, students and their families, SIUC will continue to display a culture of care and demonstrate to our students and their families that they are an important part of the community. For information on Saluki Cares: Call (618) 453-2461, email siucares@siu.edu, or http://salukicares.siu.edu/.

SAFETY AWARENESS FACTS AND EDUCATION: Title IX makes it clear that violence and harassment based on sex and gender is a Civil Rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, etc. If you or someone you know has been harassed or assaulted, you can find the appropriate resources here: http://safe.siu.edu.

SIU COUNSELING AND PSYCHOLOGICAL SERVICES (CAPS): Mental health counseling services are available by calling CAPS at (618) 453-5371. CAPS offers confidential same-day services and ongoing counseling. For after hours crisis care, students are encouraged to call 988, 911, or present to their nearest emergency room.

WITHDRAWAL POLICY (Undergraduate Only): Students who officially register for a session must officially withdraw from that registration in a timely manner to avoid being charged as well as receiving a failing grade for those classes. An official withdrawal must be initiated by the student, or on behalf of the student through the academic unit, and be processed by the Registrar's office. For the proper procedures to follow when dropping courses and when withdrawing from SIUC visit: http://registrar.siu.edu/students/withdrawal.php.

SIUC'S EARLY WARNING INTERVENTION PROGRAM (EWIP): Students enrolled in courses participating in SIUC's Early Warning Intervention Program might be contacted by University staff during a semester. More information can be found at the University Core Curriculum's Overview webpage: https://corecurriculum.siu.edu/for-faculty/.

EMERGENCY PROCEDURES: We ask that you become familiar with Emergency Preparedness at SIU. Emergency response information is available on posters in buildings on campus, on the Emergency Preparedness at SIU website, and though text and email alerts. To register for alerts visit: http://emergency.siu.edu/.

CATALOGS:

catalog.siu.edu
gradcatalog.siu.edu - Graduate policies often vary from Undergraduate policies. To view the applicable policies for graduate students, please refer to the graduate catalog.

CENTER FOR LEARNING AND SUPPORT SERVICES:

Tutoring: https://clss.siu.edu/
Math Labs: http://math.siu.edu/courses/course-help.php

WRITING CENTER: http://write.siu.edu/

PLAGIARISM: See the Student Conduct Code: http://srr.siu.edu/student-conduct-code/

INCOMPLETE POLICY (Undergraduate Only): http://registrar.siu.edu/grades/incomplete.php

REPEAT POLICY: http://registrar.siu.edu/students/repeatclasses.php

MORRIS LIBRARY HOURS: https://libcal.lib.siu.edu/hours/

ADVISEMENT: http://advisement.siu.edu/

SIU ONLINE: https://online.siu.edu/