Southern Illinois University
Department of Computer Science
CS 330 - Introduction to the Design and Analysis of Algorithms
Semester Hours: 3
FALL 2022 SYLLABUS

Faculty Information

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Teaching Assistant
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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/Time

MWF 9:00-9:50 AM, EGRA 308
**Final Exam**

Final exam date/time: Dec 12, 2022 - Dec 16, 2022.

**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**


**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:

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<thead>
<tr>
<th>Grade</th>
<th>93 – 100</th>
<th>90 – 92</th>
<th>87 – 89</th>
<th>83 – 86</th>
<th>80 – 82</th>
<th>77 – 79</th>
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**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.
MISSION STATEMENT FOR SOUTHERN ILLINOIS UNIVERSITY CARBONDALE

SIU embraces a unique tradition of access and opportunity, inclusive excellence, innovation in research and creativity, and outstanding teaching focused on nurturing student success. As a nationally ranked public research university and regional economic catalyst, we create and exchange knowledge to shape future leaders, improve our communities, and transform lives.

IMPORTANT DATES
Semester Classes Begin: ..........................................................................................08/22/2022
Last day to add full-term course (without Dean’s signature):.................................08/28/2022
Last day to add full-term course (after Dean’s signature):.................................08/28/2022
Last day to withdraw from the University with a full refund:..............................09/02/2022
Last day to drop a full-term course for a credit/refund:.................................09/04/2022
Last day to drop a full-term course (W grade, no refund):.........................10/30/2022
Final examinations:..............................................................................................12/12-16/2022

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/schedule/class/index.php.

FALL SEMESTER HOLIDAYS
Labor Day 09/05/2022
Election Day 11/08/2022
Veterans Day 11/11/2022
Thanksgiving Break 11/19-11/27/2022

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, SIU 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 kind 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

COVID-19
SIUC’s policy on face masks and social distancing is consistent with the guidance from the Centers for Disease Control and Prevention and the Illinois Department of Public Health. For up-to-date information, students, faculty, and staff should visit SIUC’s COVID website (siu.edu/coronavirus), which includes the Saluki Safety Plan. People can also send an email to pandemicinfo@siu.edu.

MONKEYPOX
SIUC is monitoring the developments with monkeypox. Monkeypox can affect anyone regardless of gender identity or sexual orientation, and we ask that our campus community remember our commitment to diversity, equity and inclusion. Students who suspect they may have monkeypox may visit Student Health Services for evaluation. Additional information can be found on the CDC website.

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 SIU visit: http://registrar.siu.edu/students/withdrawal.php.

SIU’S EARLY WARNING INTERVENTION PROGRAM (EWIP)
Students enrolled in courses participating in SIU’s Early Warning Intervention Program might be contacted by University staff during a semester. More information can be found at the Core Curriculum’s 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 through 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: http://tutoring.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: http://library.siu.edu/hours

ADVISEMENT: https://advisement.siu.edu/

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

Need help with an issue? Visit SALUKI SOLUTION FINDER at http://solutionfinder.siu.edu/

SIU, a public research university located in Carbondale, Illinois, is nationally ranked and a regional economic catalyst. We create and exchange knowledge to shape future leaders, improve our communities, and transform lives.

Created by APAP Office

Office of the Provost https://provost.siu.edu/ Fall 2022