Faculty Information

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Teaching Assistant  
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**TA Office Hours:** Monday 4-6pm and Wednesday 10-11am

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**

MWF 9:00-9:50 AM, EGRA 207
Final Exam

Final exam date/time: Dec 11, 2023 - Dec 15, 2023.

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:

<table>
<thead>
<tr>
<th>Score Range</th>
<th>Grade</th>
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<tbody>
<tr>
<td>93 – 100</td>
<td>A</td>
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<tr>
<td>90 – 92</td>
<td>A-</td>
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<tr>
<td>87 – 89</td>
<td>B+</td>
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<td>83 – 86</td>
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<tr>
<td>60 – 69</td>
<td>D</td>
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<td>0 – 59</td>
<td>F</td>
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</tbody>
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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.