School of Computer Science and Information Systems

44-349-01/44-599-01:Survey of Algorithms(3 hrs.)
Spring 2023

Instructor:	Dr. Nathan Eloe	**Email:**	`nathane@nwmissouri.edu`
Office hrs:	TR 9:00–11:00, 1:00–2:00; W 9:00–10:00	**Office:**	CH2270
Phone:	660.562.0832		

Prerequisites: 44-242 and 44-249, with a grade of C or better, or instructor's approval.

There is no textbook for this course. Course slides and additional materials will be made available on the course website. Additional material will be presented in class.

For this course, there will be several programming projects where you will be timing the execution time of algorithms you implement. You may choose to write your solutions in any programming language you wish. The grader may ask you to provide instructions to set up an environment to execute your programs to ensure their correctness.

I will provide several sources of information in this course. Slides will be distributed as PDFs.

Students are required to have a GitHub account for this course. The student's school email address should be associated with the account, but is not required to be the primary email on the account.

Course Description: A study of algorithms central to the major areas of Computer Science.

Student Learning Outcomes: *This course satisfies the following outcomes for the School of CSIS:*

Outcome	Assessment Methods
An ability to apply theory in the design and implementation of computer-based solutions	Graded on project implementations and papers.

In addition, after completing this course, a student should be able to:

- describe a variety of widely used algorithms
- trace the execution of algorithms to understand how they work
- mathematically analyze algorithms to determine their execution time as a function of problem size
- experimentally determine execution times of algorithms on different types of data sets
- choose an appropriate algorithm for a particular instance of a problem

Instructional Methods: Class time will consist primarily of lecture and student discussion about course topics, with time allotted for individual or group work on projects and homework.

Graded Course Requirements: Student progress in this course will be evaluated using the following methods:

Written Exams: There will be two written exams in this course. Exams will be announced at least one week before the exam date. A portion of the class before the exam will be devoted to review time

Final Exam: The final exam will be given during the time specified by the registrar at https://www.nwmissouri.edu/registrar/finals.htm.

Programming Projects: Periodically you will be required to write programs where you will implement various algorithms discussed in the course, determine their execution time, and write a short paper about the project. You may discuss the projects with each other, but you (or your team in the case of a group project) are responsible for writing your own code and responses to the questions posed as part of the assignment.

Quizzes and Worksheets: You will be assigned exercises to do on your own time. At any time, the instructor may choose to give a quiz in lieu of collecting an assigned worksheet.

Grading Scale: The grading scale is the standard 10 point grading scale, but may be revised in the students' favor at the instructor's discretion.

>90%	A
80%-89.9%	B
70%-79.9%	C
60%-69.9%	D
<60%	F

Late Policy: Any work submitted within 24 hours of the deadline will receive half of the credit that would have been received on a timely submission. Work submitted after 24 hours of the deadline will not be accepted for a grade.

The instructor may give extensions in extenuating circumstances; extensions should be discussed with the instructor before the deadline.

Course Outline/Major Topics Studied:

- **Introduction**
  - Measuring Execution Time
  - Discrete Math Review
- **Algorithm Analysis**
  - Counting Operations
  - Algorithm Analysis
  - Asymptotic Order
  - Recurrences
- **Divide and Conquer**
  - Divide and Conquer
  - Maximum Subarray Problem
- **Dynamic Programming**
  - Dynamic Programming
  - Problems: Coin Changing/Rod Cutting/Matrix Multiplication/Longest Common Subsequence
- ***EXAM 1***
- **Graphs**
  - Intro to Graphs
  - Searching Graphs
  - Topological Sort
  - Shortest Paths
  - Minimal Spanning Trees
  - Backtracking
  - Heuristic Searching
- **Text Processing**
  - Searching Text: naive vs Boyer-Moore-Horspool
  - Compressing Text
- **P vs NP**
  - Hard Problems
  - Bin Packing

Attendance: Students are expected to attend all classes as specified in the course syllabi for each course. Exams, homework due, quizzes given, or in-class assignments completed during your absence may only be handed in at a later date if the absence is excused. Excused absences include attendance at a university sponsored event (documented with an excuse signed by the university sponsor prior to the event) or by circumstances considered adequately extenuating by the course instructor. It is the responsibility of the student to promptly notify his or her instructor when unable to attend class. In order for an absence to be excused, the student must email the instructor to prior to class time. Please refer to the university policy on attendance at https://www.nwmissouri.edu/policies/academics/Attendance.pdf

Disclaimer: Course schedule is subject to change and you will be responsible for abiding by any such changes. Your instructor will notify you of any changes.

Final Exams: If an emergency occurs that prevents the administration of a course scheduled final examination, the final course grades will be calculated based on the work in the course completed to that point in time and the faculty member's considered judgment. Final exams will not be rescheduled, and a grade of "I" will not be given as a result of an institutional cancellation of a final examination. This final exam policy does not apply to online courses.

Administrative Drop: An instructor may request the Office of the Registrar delete a student from a course roster if the student has not met the prerequisite for the course as stated in the catalog, or as a result of non-attendance in the course.

University Communications: Students are expected to use their Northwest student email account for any electronic correspondence within the university. Students are also strongly advised to check their email and CatPAWS accounts on a regular basis.

Academic Integrity Policy: The students, faculty, and staff at Northwest endeavor to sustain an environment that values honesty in academic work, that acknowledges the authorized aid provided by and intellectual contributions of others, and that enables equitable student evaluation. Please refer to Northwest Missouri State University's Academic Integrity Policy at http://www.nwmissouri.edu/policies/academics/Academic-Integrity.pdf

Special Accommodations Policy: Northwest Missouri State University complies with Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990 [ADA] and the ADA Amendments Act of 2008 [ADAAA]. If a student has a disability that qualifies under the ADA/ADAAA and requires accommodations, they should contact the Office for Equity and Accessibility for information on appropriate policies and procedures at 660.562.1639, or pjp@nwmissouri.edu / ADA@nwmissouri.edu. For the university policy on disability accommodation refer to http://www.nwmissouri.edu/policies/student/Disability-Accommodation.pdf.

Non-discrimination and Anti-harassment Policy: Northwest Missouri State University is committed to maintaining an environment for all faculty, staff, students, and third parties that is free of illegal discrimination and harassment. Please refer to the Non-Discrimination and Anti-Harassment Policy at http://www.nwmissouri.edu/diversity/titlevi.htm.

Family Education Rights and Privacy Act (FERPA) Policy: Family Educational Rights and Privacy Act of 1974, as amended (commonly known as the Buckley Amendment), is a federal law which provides that colleges and universities will maintain the confidentiality of student education records. Please refer to the Family Educational Rights and Privacy Act (FERPA) Policy at
http://www.nwmissouri.edu/policies/academics/Family-Educational-Rights-and-Privacy-Act.pdf

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