CIS 550 Introduction to Algorithms Syllabus

Cleveland State University
Department of Electrical Engineering and Computer Science

January 2023

Class Times: Tue. & Thur. 12:30-1:45 PM Classroom: BH 402	Instructor Office Hours: M & W 10:00am-12pm please make appointment in advance face-to-face: wear mask Zoom: link: https://csuohio.zoom.us/j/3580728865
Instructor: Qin Lin Office: FH 228	Email: q.lin80@csuohio.edu

Pre-requisite

CIS 265: Data Structures and Algorithms
MTH 220: Discrete Mathematics

Course Description

This course covers how to use elementary data structures (arrays, heaps, balanced binary search trees, hash tables) and algorithmic approaches to solve classical problems (sorting, graph searching, dynamic programming). It introduces basic performance measures and analysis techniques for these problems. Computation complexity such as P, NP, hardness, and completeness will also be introduced.

Expected Outcomes

- Have a solid concept of algorithm design;
- Sharpen mathematical and analytical skills for analyzing algorithms;
- Understand P, NP, and NP-Complete;
- Solve simple/moderate difficult algorithmic problems arising in applications;

- Implement the algorithm design by using high-level programming languages.

Course Learning Objective

Students will be able to

- describe advanced data structures and classical algorithms and their complexities;
- identify algorithmic solutions to solve simple/moderate difficult algorithmic problems arising in applications;
- implement the algorithm by using high level programming language.

Programming language

To make everything consistent, we recommend using Python as the programming language in this course. Students who really want to use other languages in the assignments should translate the main functions by themselves.

Course Materials

Textbooks:

- **A. Levitin, Introduction to The Design and Analysis of Algorithms, 3nd Edition, Pearson, 2012.**
- Recommenced as supplement but not required: T.H. Cormen, C.E. Leiserson, R.L. Rivest, and C. Stein, Introduction to Algorithms, 3nd Edition, the MIT Press, Cambridge Massachusetts, 2009.

Course Requirements and Grading Policies

The course grade is based on a student's overall performance through the entire semester. The final grade is distributed among the following components:

Assignment	Percentage of Grade
Assignments	35%
Mid-term Exam	20%
Final Exam	25%
Quizzes	20%

- Assignments
  1. Assignments include written assignments and programming assignments. All assignments must be submitted through blackboard. Written assignments contain questions for algorithm analysis and design to solve problems, and programming assignments are for implementation of algorithms. **Note:** please submit .pdf file for written assignments and use Python (recommended) to do programming assignments.

- Quizzes and Exams 2. All quizzes and exams are in-class and closed-book. They should be submitted before the the end of classes.

Bug bounty: Please report errors in homework and exams to the instructor verbally or via email. For each such error, the first student to report it receives 1% bonus to their course grade. This bonus cannot exceed 3% total, i.e. three reports.

Point Conversions: Note the following point conversion is subject to any changes.

Letter	Percentage
A	$> 90\%$
A-	$> 85\%$
B+	$> 75\%$
B	$> 70\%$
B-	$> 65\%$
C+	$> 60\%$
C	$> 55\%$
D	$> 50\%$
F	$>= 0\%$

Course Policies

Late submissions for each homework are accepted up to TWO days after the original deadline. Late submissions with valid excuse are accepted up to FOUR days after the original deadline. Completed

homeworks submitted late receive 80% credit. The late submission process is identical to the regular submission process, with the last late submission used for grading. **No other late submissions are accepted.**

Missed Quiz

For missed quizzes, everyone is allowed to make up only one missed quiz through the whole semester. Please come to the instructor's office during office hours or make an appointment ahead for making up quizzes.

Collaboration Rule

You may consult your classmates (or study group) on general issues about the assignment, but your written work remains private. You should neither show another your work nor permit another to look at it. Beyond that, you should adopt an "empty hands" attitude toward collaboration: talk about the assignment as you wish, but leave the conversation with nothing written. You expect that submission will be screened for plagiarism check. It is your responsibility to keep your written and programming assignments and not readable by others.

Academic Honesty Policy

Academic misconduct is the conscious attempt to subvert the guidelines of an assessment by using the work or ideas of others without giving them credit for it. Submitting work created by someone else, paying for the work of someone else, collaborating with another student to produce work that is not for a group assignment, and using the words or ideas of another without citation constitutes an act of academic dishonesty in the context of this course. I expect all of the written work in this class to be the work of each student alone. In cases of identified academic dishonesty the student will receive a grade of F for the assignment. Further action may also be pursued in accordance with CSU policy on academic integrity. See https://www.csuohio.edu/sites/default/files/3344-21-02.pdf for CSU Policy on academic misconduct .

IMPORTANT - If you are ever uncertain if actions you are taking count as academic dishonesty, please ask me.

"Ears Out" Environment for Exams

As part of the University's ongoing efforts to prevent cheating, and based on evidence of increased use of headphones and ear piece devices to permit cheating on exams, all students are required to display their ears for the duration of any exam. The policy may require adjustment to hair or clothing. Any student not complying with this policy will, after a warning, be issued a zero on the exam. Students with concerns about their compliance with this policy should contact the Office for Institutional Equity at OIE@csuohio.edu or 216-687-2223 at least one week before the exam.

Disability Accommodation

Students with a documented disability (physical, psychological, learning, or other disability which affects academic performance) who would like to receive academic accommodations should contact CSU's Disability Services for additional information. In order for accommodation requests to be considered for approval, the student is responsible for providing sufficient documentation of the disability to the office of Disability Services and participating in an interactive

discussion with the staff. See the page https://www.csuohio.edu/disability/disability for contact information. Accommodations may be requested at any time but are not retroactive. Please contact the office of Disability Services early in the semester/module for guidance.

Schedule and Topics

Below is a tentative schedule of the course and topics covered. Schedule is subject to change.

Week	Lecture Dates	Topics	Assig. & Quiz	Note
Week 1	Jan. 17, 19	Syllabus & CH. 1 : Introduction 1.1-1.3		
Week 2	Jan. 24, 26	CH. 1.4 Data Structure Review & CH 2.1-2.2: Asymptotic Notations		
Week 3	Jan. 31, Feb. 2	CH. 2.3-2.4: Nonrecursive and Recursive Algorithm & CH. 2.6: Empirical Analysis	Assignment	
Week 4	Feb. 7, 9	CH. 3.2, 4.4, 4.5: Algorithms for Array Search (Sequential search, Binary search)	Quiz	
Week 5	Feb. 14, 16	CH. 3.1, 4.1: Algorithms for Array Sorting (selection sort, bubble sort, insertion sort, merge sort, quick sort)		
Week 6	Feb. 21, 23	CH. 6.3, 6.4: Algorithms for Tree Sorting (heap sort, AVL sort)	Assignment	
Week 7	Feb. 28, Mar. 2	CH. 7.1 Non-Comparison based Algorithms for Sorting(counting sort, radix sort)	Quiz	
Week 8	Mar. 7, 9	Review & Mid-term Exam		Mid-Semester Grading Deadline March 14
Week 9		No class		Spring Recess (March 12-19)
Week 10	Mar. 21, 23	CH. 7.3 Hashing	Assignment (Hash)	
Week 11	Mar. 28, 30	Numeric problmes (integer arithmetic, Newton's method)	Quiz (hash)	
Week 12	Apr. 4, 6	CH. 3.4-3.5: Graph Search (BFS, DFS)	Assignment (BFS, DFS)	
Week 13	Apr. 11, 13	CH. 9.3 Shortest Path Problem (Dijkstra), Minimum-cost spanning tree		
Week 14	Apr. 18, 20	Shortest Path Problem (Bellman-ford)	Quiz	
Week 15	Apr. 25, 27	CH. 8: Dynamic Programming (MultiStage Graph, Floyd-Warshall, Longest common sebsequence)	Assignment (DP)	
Week 16	May 2, 4	Chapter 11.3: Introduction to P, NP, NPC and NPC Problems	Quiz	Last Day of Classes: May 5
Week 17		Final Exam		
Week 18		Final Grades Available to Students		Deadline May 17