OAKLAND UNIVERSITY
Department of Mathematics and Statistics
Student Information Sheet and Syllabus

COURSE: **APM 3610/CSI 3610, Design and Analysis of Algorithms**, 4 credits

SEMESTER: **Summer (S01) 2024**

Faculty	Office	CRN	Classroom	Time
László Lipták	**346 MSC**	**30841/30842**	**237 DH**	**MW 5:30–8:50 p.m.**

E-MAIL: `liptak@oakland.edu`
This is the preferred method of communication. I'll do my best to reply to emails within 24 hours. If you don't get a reply within that time, please send be a reminder.

Course info and scores will be available in Moodle.

ATTENDANCE: I expect that you attend every class and only miss class due to events outside your control. I plan to record classes using Panopto unless there is an issue with technology, so the recording is not guaranteed. I will post class notes in Moodle after class.

OFFICE HOURS: Wed 3–4 p.m. or by appointment in my office (346 MSC). During office hours I help everyone who showed up together and discuss questions in a round-robin manner. If you need to meet me at a different time, ask me for an appointment. Before you ask for help I expect you to give a serious attempt to solve the problem, i.e., know the relevant definitions and theorems and spend at least 15 minutes thinking about possible solutions.

PREREQUISITES: (CSI 2310 or CSI 2290) and APM 2663 with a grade of C or higher

TEXT: *Algorithms*, by R. Sedgewick and K. Wayne, 4th edition (Pearson, 2011).

CATALOG DESCRIPTION: Computer algorithms, their design and analysis. Strategies for constructing algorithmic solutions, including divide-and-conquer, dynamic programming and greedy algorithms. Computational complexity as it pertains to time and space is used to evaluate the algorithms. A general overview of complexity classes is given.

COURSE OBJECTIVES: This course gives an introduction to computer algorithms, their design and analysis. You will need to demonstrate that you

1. Are able to explain how major algorithms work and illustrate them on small examples;
2. Are able to analyse the space and time complexity of algorithms;
3. Are able to apply common algorithmic strategies to devise new algorithms to solve problems.

GRADING POLICY: Your course grade will be based upon the scores on your assignments, presentations, midterm and final exams. The percentage score you get will be converted to a final grade. The exact conversion scheme will be determined at the end of the term. I reserve the right to make adjustments if I deem it necessary.

The following list shows the lowest possible final letter grade that a given percentage score will earn (the grade may be higher than this):

$95\% \to$ A	$70\% \to$ C+
$90\% \to$ A-	$65\% \to$ C
$85\% \to$ B+	$60\% \to$ C-
$80\% \to$ B	$55\% \to$ D+
$75\% \to$ B-	$50\% \to$ D

HOMEWORK ASSIGNMENTS: There will be regular homework assignments during the semester constituting 30% of your total score.

Your solutions should be handwritten, then scanned and uploaded to Moodle. Write as clearly and cleanly as you can, use sentences, and explain the steps of your solutions. I encourage you to form study groups. You can discuss the problems and their solutions with each other, but the actual solutions you submit should be your own work (see also ACADEMIC HONESTY). You will have a chance to resubmit each assignment at least once with no penalty. For solutions with minor deficiencies you will have the option of explaining the solution to me for full credit without resubmitting it. Ask for a separate appointment to do this.

Due to the possibility of resubmission, solutions for homework assignment problems will rarely be discussed in class. If you have questions about the homework, ask me after class or during office hours. The textbook has a lot of additional problems, and I recommend that you solve some that interest you as preparation for the exams.

SUBMITTING YOUR WORK: All assignments in the course will need to be scanned and uploaded to Moodle. Each submission should be one file in a multi-page PDF format. You can use any scanning app; I recommend Adobe Scan. A demo of how to use it will be available on Moodle. You can resubmit assignments in the same place you submitted the original assignment as a new file.

MIDTERM EXAM: There will be one Midterm Exam on Monday, **June 3rd**. This will be a closed-book exam constituting 30% of your total score; notes and textbooks will not be allowed.

MAKE-UP POLICY: There will be no make-ups with the exception of students who participate as an athlete, manager or student trainer in NCAA intercollegiate competitions, or participate as a representative of Oakland University at academic events and artistic performances approved by the Provost or designee. If you miss the midterm exam with a reasonable excuse (determined by me; needs to be caused by a life event outside your control), its weight will be transferred to the final exam.

FINAL EXAM: **The Final Examination is comprehensive** and will be given on **Monday, June 24, 2024, 6:30–9:30 p.m.** in 237 DH. This will be a closed-book exam constituting 40% of your total score; notes and textbooks will not be allowed.

ACADEMIC HONESTY: Cheating is a serious academic crime. Oakland University policy requires that all suspected instances of cheating be reported to the Academic Conduct Committee for adjudication. Anyone found responsible of academic misconduct in this course may receive a course grade of F at my discretion in addition to any penalty assigned by the Academic Conduct Committee. Working with others on an assignment does not constitute cheating (unless explicitly forbidden); handing in an assignment or program that has essentially been copied from someone else or from an online resource does.

UNIVERSITY REGULATIONS: You can find additional information at the OU policies website. These include the bereavement leave policy and additional university policies.

STUDY HABITS: I can only guide and help you by providing the framework for the course: **you are responsible to learn the material.** Most of this learning must take place *outside* the classroom. This will usually take two to three hours outside of class for each hour in class, but may take longer in some cases. Our aim is to be able to apply the material to new situations, hence the focus is on understanding rather than merely memorizing. How can you achieve that?

- *Read the textbook:* This must be done carefully and slowly. You may need to re-read and analyze sentences, since the text is very dense, unlike a novel. You should have pencil and paper ready to work with while reading to draw pictures and fill in omitted steps. Understand and **learn** the definitions and the reasons for important properties. Whenever possible, read the relevant sections *before* we discuss them.
- *Summarize the material:* Review the material discussed in each class that evening. Create flash cards later for the main definitions, properties, procedures, and theorems. Work out additional examples until you can do them without referring to your notes. Summarize the main ideas of theorems and algorithms to about two-three sentences from which it will be easier to reconstruct the details.
- *Ask questions:* In class, during office hours or during an appointment. This is extremely important because asking a question stimulates your brain to think about the question more thoroughly, helping you to figure out the answer yourself. If you have difficulties or get stuck on a problem, get it clarified as soon as possible. If you make a mistake, rework the problem with the idea that you will avoid similar mistakes later.
- *Review the material regularly:* It will take time and practice to digest and really understand the new concepts, properties, and theorems. Regularly practice them using your flash cards or with your classmates to test whether you can recall them from memory.
- *Study with others:* If you can, form study groups to discuss solutions to problems with your classmates and to practice with them. Test each other whether you can recite definitions, properties, and procedures from memory.

Syllabus: Selected topics from Chapters 1–6 of the textbook, time permitting:

- Sorting, Mergesort, Quicksort, Priority Queues
- Searching, Binary Search Trees, Balanced Search Trees
- Graph Algorithms, Depth-First Search, Breadth-First Search, Minimum Spanning Trees, Shortest Paths
- String Sorts, Substring Search
- Intractability, P vs. NP, Satisfiability, NP-completeness

Important Dates:

May 13	Last day for "no-grade" drop and adding a class
May 27	Memorial Day (no classes)
June 3	Midterm Exam (Monday)
June 7	Last day official withdrawal
June 21	Classes end 10:00 p.m.
June 24	**Final examination (Monday, 6:30–9:30 p.m.)**