

Syllabus

*University of Wisconsin - La Crosse**September 5*

— SUBJECT TO CHANGE —

Time: Monday, Wednesday and Friday 1:10 PM – 2:05 PM**Classroom:** Centennial 1401**Professor:** Dr. David Mathias**email:** dmathias@uwlax.edu**website:** <http://hdmathias.github.io>**Office:** Wing Technology 212**Office Hours:** Monday 11:00 – 12:00, Tuesday 3:30 – 4:30, Wednesday 11:00 – 12:00 and Friday 11:00 – 12:00.**Text Book:** Jon Kleinberg & Eva Tardos, Algorithm Design, Addison Wesley, 2006. ISBN13: 978-0-321-29535-4.**Learning Management System:** We will use Canvas in this course.**Catalog Description:** Three hours. Prerequisites: CS 340; MTH 207. An in-depth analysis of computational complexity of a wide range of algorithms for problems of fundamental importance to computer science. Algorithms to be examined include: sorting, pattern matching, and various graph algorithms.**Student Learning Outcomes:** This is an upper-level computer science elective that is an appropriate course for a student who wants to: understand the fundamentals of algorithm design and analysis. It is excellent preparation for those who wish to take graduate courses in Computer Science.

By the end of the course, students should be able to:

- Analyze the computational complexity of an algorithm using asymptotic notation.
- Design efficient algorithms for various types of problems.
- Understand the difference between the complexity of an algorithm that solves a problem and the complexity of a problem.

- Derive and solve recurrence relations and summations.
- Apply classical search, sorting, selection, and graph algorithms.
- Demonstrate familiarity with NP-completeness and NP-complete problems.

Homework: The largest single component of your grade in this class is homework. Almost every class meeting, I will assign a “Daily Problem.” Without exception, these are due at the **beginning of the next class meeting**. If you will miss a class or are running late, you may submit your solution to me prior to class. If you submit electronically, the file must be a pdf and must adhere to the rules below for solution format. Note that the term “Daily Problem” does not imply a limit of one problem nor does it guarantee that there will be an assignment every class. In addition, longer-term homework assignments are possible.

Rules for homework submission:

- Solutions are due at the beginning of class. There are no exceptions. The reason is that we will go over the problems when I collect them so that you see a solution (or sketch of a solution) while the work is still fresh in your mind.
- Write on one side of the page only.
- Put your name, the due date and the problem number on separate lines in the upper left corner of the first page.
- If your solution is multiple pages, **staple** the pages in the upper left corner. Do not simply fold the corners of the pages – use an actual metal staple.
- Write legibly – I can’t grade what I can’t read.
- Did I mention that solutions are due at the beginning of class?

Programming Assignments: Despite the fact that this is a theory course, there is a programming component to the course work. These assignments will give you an opportunity to apply the theoretical concepts and gain an appreciation for the real-world implications of some of the topics we discuss. Programming assignments are due at 11:59 PM on the due date. Late assignments are accepted for up to 24 hours after they are due. The penalty for late submission is 20%.

Programming will be done in Python 2.7. If you don’t already know Python, this is an opportunity to learn an interesting and hot language. Little to no class time will be devoted to Python instruction. You all know how to program and should be able to acquire skills in a new language on your own. Note that I don’t expect you to become a Python expert and will not test you on Python. You simply have to acquire a working knowledge of the syntax and key concepts. There are many excellent resources online.

- <https://docs.python.org/2.7>
- <https://docs.python.org/2.7/tutorial/index.html>
- <https://www.learnpython.org>

Evaluation and Assessment:

- 25% – Quizzes
- 30% – Homework
- 10% – Programming assignments
- 10% – In-class participation
- 25% – Final exam
- There will be no makeup exams or quizzes except with advance notice (at least one week) of an approved UWL activity or with a doctor's note confirming serious illness. In all cases, it is the student's responsibility to provide written documentation. Late assignments will not be accepted barring exceptional circumstances. There will be no extra-credit work.

Grading Scale: Letter grades will be assigned according to the table below. Note that if a curve is applied, it will work in your favor, not to your detriment. Let x be your weighted average for the course. Then your letter grade is:

- A: $x \geq 93$
- AB: $89 \leq x < 93$
- B: $83 \leq x < 89$
- BC: $79 \leq x < 83$
- C: $70 \leq x < 79$
- D: $60 \leq x < 70$
- F: $x < 60$

Attendance: You are expected to attend class. Attendance will constitute part of the participation portion of the course grade. In addition, your participation grade will be determined by how much you engage with the class. This includes asking questions, answering questions, completing in-class exercises, etc.

Academic Integrity: Academic misconduct is a violation of the UWL Student Honor Code (<http://catalog.uwlax.edu/undergraduate/academicpolicies/studentconduct>) and is unacceptable. I expect you to submit your own original work and participate in

the course with integrity and high standards of academic honesty. When appropriate, cite original sources, following the style rules of our discipline.

PLEASE NOTE that whenever a grade penalty is imposed due to academic misconduct, the instructor is required to write a letter documenting the misconduct. Copies are sent to the student, to the Office of Student Life (where the letter remains on file in the student's record), and to the Dean of the student's College. Refer to <https://www.uwlax.edu/student-life/student-resources/student-handbook> for a detailed definition of academic misconduct, and for possible sanctions and consequences. The Office of Student Life can also assist.

Plagiarism or cheating in any form may result in failure of the assignment or the entire course, and may include harsher sanctions. Refer to the Student Handbook #14.02 for a detailed definition of academic misconduct.

For helpful information on how to avoid plagiarism, go to "Avoiding Plagiarism" on the Murphy Library website (<http://libguides.uwlax.edu/plagiarism2>). You may also visit the Office of Student Life (<https://www.uwlax.edu/student-life/>) if you have questions about plagiarism or cheating incidents. Failure to understand what constitutes plagiarism or cheating is not a valid excuse for engaging in academic misconduct.

Course Policy on Collaboration: For homework and programs, you may discuss **general concepts** with classmates. However, you should not collaborate in the preparation of solutions or programs. Using any solution that you did not create yourself, including but not limited to solutions found on the Internet, is considered academic misconduct.

Inclusive Excellence: UWL's core values include "Diversity, equity, and the inclusion and engagement of all people in a safe campus climate that embraces and respects the innumerable different perspectives found within an increasingly integrated and culturally diverse global community" (<https://www.uwlax.edu/chancellor/mission>). If you are not experiencing my class in this manner, please come talk to me about your experiences so I can try to adjust the course if possible.

Student Evaluation of Instruction: UWL conducts student evaluations electronically. Approximately 2 weeks prior to the conclusion of a course, you will receive an email at your UWL email address directing you to complete an evaluation for each of your courses. In-class time will be provided for students to complete the evaluation in class. Electronic reminders will be sent if you do not complete the evaluation. The evaluation will include numerical ratings and, depending on the department, may provide options for comments. The university takes student feedback very seriously and the information

gathered from student evaluations is more valuable when a larger percentage of students complete the evaluation. Please be especially mindful to complete the surveys.

Useful UWL Resources: The following links are provided for your convenience. This is not an exhaustive list of services available on campus.

ACCESS Center: <http://www.uwlax.edu/access-center>

Student Support Services: <http://www.uwlax.edu/student-support-services>

For statements regarding Sexual Misconduct, Religious Accommodations, Students with Disabilities, and Veterans and Active Military Personnel, please see:

<https://www.uwlax.edu/info/syllabus>

Approximate schedule:

Week:		Topics:	Text:
1	September 3	Course intro; Why study analysis of algorithms? The sorting problem; Insertion sort	
2	September 10	Introduction to asymptotics; Mathematics review	2.1–2.2 2.4
3	September 17	Mergesort; Recurrence relations Recursive insertion sort Quiz 1	5.1–5.2
4	September 24	Divide and conquer; Quicksort; Heaps	5.4 pp. 731-4 2.5
5	October 1	Sorting lower-bound I lied: Breaking the bound	
6	October 8	It's time to choose your spouse: Stable matching Quiz 2	1.1
7	October 15	Choosing without sorting: Selection	
8	October 22	Graphs & trees; Traversal	3.1–3.3
9	October 29	Common graph algorithms Quiz 3	3.4–3.6
10	November 5	Minimum spanning trees Greed is good: Algorithms by Gordon Gekko	4.5 4.1–4.2
11	November 12	Shortest paths Union-Find data structure	4.4, 4.6
12	November 19	Hard problems: A gentle intro to complexity theory Quiz 4	8.1–8.4
13	November 26	Randomized algorithms	13.1, 13.3 13.5
14	December 3	Genetic algorithms	
15	December 10	TBD	
Final		Friday December 14 at 12:15 PM	