



OTTERBEIN  
UNIVERSITY

# Syllabus

## COMP 4500-01

## Algorithm Design and Analysis

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*Spring Semester 2024*

### Basic Information

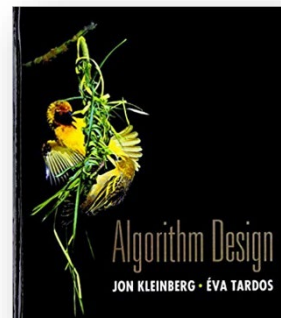
**Credits:** 3.0  
**Time:** **MWF** 9:10 - 10:05 a.m.  
**Location:** Point 113  
**Prerequisites:** COMP 2100 and COMP 2230

### Instructor Information

**Name:** Dr. Barry Wittman  
**E-mail:** [wittman1@otterbein.edu](mailto:wittman1@otterbein.edu)  
**Office:** Point 105  
**Phone:** (614) 823-2944  
**Office hours:** **MWF** 10:15 – 11:15 a.m.,  
**MWF** 2:00 – 4:00 p.m.,  
**TR** 10:00 – 11:15 a.m.,  
**T** 2:00 – 4:00 p.m.,  
**R** 2:00 – 5:00 p.m.,  
and by appointment

### Text Book

Jon Kleinberg and Éva Tardos  
***Algorithm Design***  
1<sup>st</sup> Edition, 2005, Pearson  
ISBN-10: 0321295358  
ISBN-13: 978-0321295354



## Course Catalog Description

Formal techniques for the analysis of algorithmic complexity, both space and time. Algorithm design techniques, such as brute force, divide and conquer, dynamic programming, backtracking, etc., are explored. Advanced algorithms and data structures are introduced. The concept of computational complexity is introduced along with NP-completeness.

## Student Learning Outcomes

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

- I. Apply knowledge of computing and mathematics, including algorithms and their analysis, to solve problems
- II. Determine the Big O bound for many kinds of iterative and recursive algorithms
- III. Design greedy solutions for problems
- IV. Design divide-and-conquer solutions for problems
- V. Design dynamic programming solutions for problems
- VI. Apply and analyze graph algorithms, including:
  - A. Connectivity
  - B. Minimum spanning tree
  - C. Shortest path
  - D. Topological sort
- VII. Prove that problems are NP-complete
- VIII. Prove bounds on approximation algorithms

## Program Learning Outcomes

The Computer Science major has a set of ten Student Learning Outcomes (SLOs). Work in this course contributes to the following SLOs:

1. Students are proficient in logic and discrete mathematics.
2. Students can methodically solve algorithmic problems in at least one programming language.
3. Students develop an understanding of the recurring themes of abstraction and computation.

## Method for Determining Course Grade

The final grade for this course will depend upon the grades and scores earned on course components weighted as follows:

- 32%** Seven equally weighted homework assignments
- 5%** Pop quizzes
- 3%** Reading summaries
- 45%** Three equally weighted midterm exams
  - Exam 1:** **Tentatively** scheduled for 02/05/2024
  - Exam 2:** **Tentatively** scheduled for 02/28/2024
  - Exam 3:** **Tentatively** scheduled for 04/01/2024
- 15%** **Final Exam:** 8:00 – 10:00 a.m., 04/24/2024

Grades will be computed by rounding numerical percentages to the nearest integer and applying the following table:

<b>A</b>	93-100	<b>B-</b>	80-82	<b>D+</b>	67-69
<b>A-</b>	90-92	<b>C+</b>	77-79	<b>D</b>	60-66
<b>B+</b>	87-89	<b>C</b>	73-76	<b>F</b>	0-59
<b>B</b>	83-86	<b>C-</b>	70-72		

Grades for each assignment, quiz, and exam will be recorded in [Blackboard](#). Students may compute their current average by using these scores with the weights listed above.

## Attendance and Participation Policy

Attendance is expected of every student at every lecture. Students are responsible for all content covered in class as well as assigned book chapters. Students should come to class with their text books, having read the material to be covered that day. Students who have not prepared for class may be asked to leave. Due to their nature, pop quizzes cannot be made up.

Students are expected to come to class with a three-sentence summary of the reading for that day. Roughly three times a semester without advance warning, each student will be expected to recite their summary in front of the class. Summaries are not expected to be perfect. These summaries are intended to ensure adequate preparation.

Students are expected to attend in-person class sessions as indicated on the schedule. However, if a student is not feeling well, that student should not come to the in-person class session that day. To catch up on work, students should visit the instructor during office hours or another scheduled meeting time.

Except in the case of documented emergencies, exams cannot be made up afterwards. For excused absences, students must arrange to take the exam *before* the normally scheduled time. Arrangements must be made with the instructor at least two weeks prior to the scheduled time.

Students are expected to maintain an attitude of respect at all times toward their colleagues, the equipment, and the instructor. Students are expected to refrain from using technology for non-course related purposes during class time and will be penalized 1% of the final grade for each occurrence. Students who use offensive language or are otherwise disruptive of the classroom will be asked to leave.

## Expectations for Out-of-Class Work

### Homework Assignments

All homework assignments are to be done individually. Each assignment must be uploaded into [Blackboard](#) before 11:59 p.m. on the due date. Assignments submitted after the deadline will not be accepted. Written assignments must be turned in as a LaTeX, Word, or PDF document. LaTeX is strongly encouraged and will earn extra credit.

## Academic Honesty

Academic dishonesty includes cheating, complicity, falsification, multiple submission, and plagiarism. To understand better what each of these kinds of dishonesty entails, see the full statement on Academic Dishonesty in the [Campus Life Handbook](#), beginning at the bottom of page 47.

All cases of suspected Academic Dishonesty will be forwarded to Academic Affairs. To learn more about the process, see the above cited section of the [Campus Life Handbook](#). Academic Dishonesty may result in automatic failure of the assignment or the course itself, or even suspension or expulsion proceedings.

You are plagiarizing when you:

- Copy material from a source without using quotation marks and proper citation.
- Follow the movement of the source, substituting words and sentences but keeping its meaning, without citing it.
- Lift phrases or terms from a source and embed them in your own prose without using quotation marks and proper citation.
- Borrow ideas (that are not common knowledge) from a source without proper citation.
- Turn in a paper wholly or partially written by someone else.

If you are uncertain about when and how to cite sources, or what is allowable in completing assignment and exams, please speak with your professor.

All assignments must be completed individually, without assistance from anyone other than the instructor. Students can discuss the course material with each other in general terms, but all work must

be done individually. For exams, assignments, and all other activities in the course, students are expected to act according to the official policy on academic dishonesty and the highest standards of personal integrity.

For the first infraction of academic honesty in this course, the instructor will seek a penalty of a 0 for the project, lab, or exam in question and a reduction of a full letter grade in the final grade. If a second infraction occurs, the instructor will seek the maximum penalty possible under the University's regulations.

## **Statement on Credit Hour Definition/Expectation for Student Work**

For each credit hour of classroom or direct faculty instruction, students are expected to engage in two hours of out-of-class course-related work (readings, homework, studying, project preparation, etc.). A four-credit hour course requires eight hours per week of out-of-class work. These expectations are the same for blended and online courses, with some or all of the direct faculty instruction occurring online instead of in a classroom.

## **Nondiscrimination at Otterbein**

Otterbein University is committed to providing a welcoming environment free from unlawful discrimination. To this end, the University prohibits any form of discrimination against any person on the basis of race, color, sex, gender, pregnancy, religion, creed, marital status, partnership status, age, sexual orientation, gender identity, gender expression, national origin, disability, military status, or any other legally protected status in its programs and activities. All Otterbein faculty and staff share in the responsibility to create a safe learning environment for all students and for the campus as a whole. Students who believe they have been discriminated against should contact the Office of Human Resources, (614) 823-1805 / [hr@otterbein.edu](mailto:hr@otterbein.edu).

Any person may report sexual harassment, sexual violence, dating violence, and stalking by contacting Julie Saker, Deputy Title IX Coordinator at (614) 823-1154 / [jsaker@otterbein.edu](mailto:jsaker@otterbein.edu).

If a student would prefer to share information about sexual harassment, sexual violence or discrimination to a *confidential* employee who does not have a reporting responsibility, they can contact the Counseling Center, (614) 823-1333 / [counseling@otterbein.edu](mailto:counseling@otterbein.edu), or the WGSRC Peer Advocates, [wgsrc@otterbein.edu](mailto:wgsrc@otterbein.edu).

Information about these policies can be found [here](#).

## Disability Services

The University has a continuing commitment to providing access and reasonable accommodations for students with disabilities, including mental health diagnoses and chronic or temporary medical conditions. Students who may need accommodations or would like referrals to explore a potential diagnosis are urged to contact Disability Services (DS) as soon as possible. DS will facilitate accommodations and assist the instructor in minimizing barriers to provide an accessible educational experience. Please contact DS at [DisabilityServices@otterbein.edu](mailto:DisabilityServices@otterbein.edu). More info can also be found [here](#). Your instructor is happy to discuss accommodations privately with you as well.

## Counseling Services

Given the level of uncertainty in the world, many students might experience feelings of threat, fear, and uneasiness. For extra support – in the way of just being able to verbalize your feelings to an interested outsider, gaining some reassurance and validation of your feelings, making plans to move forward optimistically and safely – reach out to any staff. Otterbein staff want to provide not only respect but also verbal and emotional support and encouragement. The Counseling Center can be reached at (614) 823-1333. You can also call or text 988, the Suicide and Crisis Lifeline of Ohio, for 24/7 access to a mental health professional.

## Academic Support Center

The Academic Support Center (ASC) helps students develop and strengthen the skills necessary to attain their academic goals. They support student learning and success through: tutoring, teaching, disability services, and academic coaching. All services are free for Otterbein students. Their purpose is to help students be academically successful. Please contact them to request a tutor or learn more about the ASC by calling (614) 823-1610 or visiting the [ASC website](#).

## Library Services

The Courtright Memorial Library provides a broad range of services and resources, from color printing and a game collection to 24/7 access to more than 220 scholarly databases and e-books [here](#). On-campus students can access in-person help, quiet study spaces, and open computer labs during the library's [open hours](#).

Students can also access the many e-textbooks on reserve by clicking the Course Reserves tab on the library [web page](#) or find help for a specific subject area by searching [LibGuides](#).

Need more help? Students can chat with a librarian by clicking the Ask Me tab on the right side of the library homepage. Students also may e-mail the library at [library@otterbein.edu](mailto:library@otterbein.edu). For in-depth research help, make an appointment for a virtual research consultation with your [personal librarian](#).

## Tentative Schedule

The following is a tentative schedule of the topics to be covered in each week. This schedule is subject to change as need dictates. Students will be informed of changes by the instructor in class. A schedule will be kept on the [course webpage](#).

Week	Starting	Topics	Chapters	Notes
1	01/08/24	Introduction	1 and 2	
2	01/15/24	Algorithm Analysis	2	MLK Day
3	01/22/24	Graphs	3	
4	01/29/24	Greedy Algorithms I	4	
5	02/05/24	Greedy Algorithms II	4	Exam 1
6	02/12/24	Divide and Conquer I	5	
7	02/19/24	Divide and Conquer II	5 and notes	
8	02/26/24	Dynamic Programming I	6	Exam 2
	03/04/24	<b>Spring Break</b>		
9	03/11/24	Dynamic Programming II	6	
10	03/18/24	Network Flow	7	
11	03/25/24	NP-completeness	8	Good Friday
12	04/01/24	More NP-completeness	8	Exam 3
13	04/08/24	Approximation Algorithms	11	
14	04/15/24	Review	All and notes	