



## **CS-310 L01– Computer Algorithms**

### ***Spring 2022***

**Professor:** Zane Harvey

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**Phone:** 412-709-2184

**Dates/Times:** Tues/Thur Library 102 On Ground Noon-1:15 PM ET

Course Dates: Jan 4, 2024 (Tues) – April 22, 2022 (Fri) (16 weeks)

- Final Exam: Week of Monday, April 18, 2022

#### **Course Description**

Mathematical fundamentals of algorithms and algorithmic techniques. Running Time Analysis of an algorithm. Searching, Sorting, and other techniques associated with retrieving information. Advanced Data structures such as Binary Search Trees and Heaps. Graph algorithms. Dynamic Programming (Knapsack, Floyd, DNA Algorithms). Greedy algorithms (Coins, Scheduling, Huffman encoding). Course requires written programming assignments.

#### **Course Objectives**

After successful completion of this course, students will:

1. understand the running time of an algorithm;
2. know how to calculate the running time of an algorithm;
3. understand how various sorting algorithms work;
4. understand how various searching algorithms work;
5. understand binary search trees and their basic operations;
6. understand how dynamic programming works;
7. understand how greedy algorithms work;
8. understand how backtracking algorithms work;
9. understand intractable problems.

#### **Time & Locations**

Lessons for this course will be on ground in Library 102 from Noon-1:15 PM (Eastern Time). Attendance is required.

#### **Required Materials**

None

**Required Text**

*Foundations of Algorithms, 5<sup>th</sup> ed., (2015)* by Richard Neapolitan, Jones & Bartlett Learning, ISBN-13: 978-1-284-04919-0.

**Course Schedule (subject to change)**

<u>Week</u>	<u>Mon Date</u>	<u>Reading</u>	<u>Topic</u>	<u>+ Activity (Due Sun)</u>
1	1/3	App A	Review of Necessary Mathematics	
2	1/10	Ch 1	Algorithms: Efficiency, Analysis, and Order	Hw 0
3	1/17	App B	Solving Recurrence Equations	
4	1/24	-	Time Studies – CPU vs. Wall Clock Time	Hw 1
5	1/31	Ch 2	Divide and Conquer	Exam 1
6	2/7	Ch 3	Dynamic Programming	Hw 2
7	2/14	Ch 4	The Greedy Approach	
8	2/21	Ch 4	The Greedy Approach	Hw 3
9	2/28	Ch 5	Backtracking	Exam 2
10	3/7	Ch 5	Backtracking	Hw 4
11	3/14	Ch 6	Branch and Bound	
12	3/21	Ch 7	Introduction to Computational Complexity	Hw 5
13	3/28	Ch 8	More Computational Complexity	Exam 3
14	4/4	Ch 9	Computational Intractability – Theory of NP	Hw 6
15	4/11	10	Genetic Algorithms and Genetic Programming	
16	--		Final Exam	Due 4/21

Text     *Foundations of Algorithms, 5<sup>th</sup> ed., Neapolitan*  
 + =     All work due by Sunday midnight at end of week

**Grading****Grading Components**

- |   |           |
|---|-----------|
| 1. Homework Assignments (6 @ 50 pts)            | - 300 pts |
| 2. Exams (3 @ 150 pts)                          | - 450 pts |
| 3. Final Exam (1 @ 175 pts)                     | - 175 pts |
| 4. Participation (including attendance, 15 @ 5) | - 75 pts  |

There is a total of 1,000 points in this course.

Final letter grades will be determined based on the convention shown below:

90-100%	80-89%	70-79%	60-69%	0-59%
A	B	C	D	F

## **Course Requirements**

### **Homework**

The Homework assignments include creating solutions to problems as well as proving assertions/theorems. Homework assignments usually contain several individual parts which are weighted equally.

### **Participation**

Earning the maximum of the participation points in this course requires that you be actively engaged in the discussions, activities, and exercises that are conducted during the online class sessions. Being on time and present during each entire session is a good start, but you should also ensure that you have read the assigned readings, are prepared to discuss and ask questions about the material, and that you share your insights, discoveries and other techniques that have helped you understand the material with your classmates. To do this, you must ensure that your microphone is working, and that you are in a venue where you can participate vocally. Though the chat feature can be used to share some thoughts, full participation requires you to participate in a written and verbal manner. If you are having difficulties with your microphone, let me know and take steps to correct the problem as soon as possible.

### **Assignment Due Dates (Homework, Exams)**

The due date for each assignment is posted on the Course Schedule (above). Due dates always are midnight (Eastern Time) on the Sunday ending a week. Depending on class progress, the instructor reserves the right to adjust the due dates for the assignments. If this happens, students will be notified ahead of time. In most cases, the due date will be pushed back to a later date if needed to allow the class to focus more on specific concepts.

All assignments will be available via our Capitol Technology University Canvas site. You must submit your assignment results via Canvas. Submitting your assignments via alternate means such as email will not count towards your grade. Let me know as soon as possible if you are having difficulties with Canvas and contact the Capitol Technology University Support Staff ASAP to get assistance.

### **Waiting Until the Last Minute**

Start your assignments as soon as you can. As you probably know by now, working on mathematical proofs almost always takes longer than you plan. It usually helps if you read through each assignment thoroughly as early as possible, and then give yourself some time to think about it more deeply over time. If you are unsure about any part of an assignment, make sure you get answers to your questions sooner rather than later. Don't make "assumptions" – ask for clarification.

## **Exams and the Final Examination**

This course uses exams to evaluate your grasp of the topics that we cover. In addition, there is a comprehensive final exam. All exams, including the final exam, are administered within Canvas and they are timed. You may only take an exam once. The exams are open notes and open book. You may not use other resources (e.g., the Internet) during exams.

## **Course Policies**

### **Absences**

Absences must be made up in a manner prescribed by the professor and will consider the circumstances of the absence. It is important to note that material may be covered in the classroom that is not covered in the course texts. As a result, class attendance (*or arranging for a friend to take notes or record the class session*) is in your best interest. The grade of incomplete (I) will be assigned by a professor to a student who has not completed the assigned course work due to documented illness or some other emergency during the last four class sessions. A grade of "I" cannot be assigned to allow a student with poor performance additional time to raise their grade. (See the University Catalog for the policy on incomplete grades).

### **Late Work**

All assigned work must be submitted on time. You will have a long lead time in which to prepare, ask questions, and seek help. Therefore, unless a major accident, illness, natural event (e.g., hurricane), or other extenuating circumstance prevents you from submitting work on time, late assignments (including exams) will be not be accepted without prior written approval. If you know in advance that you will need to submit work late, contact me in advance and we will try to reach an accommodation.

### **Communications**

My primary way to communicate with students is through the **Canvas Inbox**. Please, only use regular email if our Canvas platform is unavailable. My email addresses are: [bwpollack@captechu.edu](mailto:bwpollack@captechu.edu) (preferred) and [barywp@gmail.com](mailto:barywp@gmail.com) (alternate email, only use if CapTechU is unavailable).

### **Academic Integrity**

All cases of suspected academic dishonesty will be reported to the appropriate school officials, and disciplinary action may result, following investigation by a judiciary committee. To learn more about the official policies of the college on this issue, please read "Academic Conduct" and "Code of Academic Integrity" beginning on page 18 and "Sanctions for Violations of Regulations" beginning on page 68 of the Student Handbook. The Student Handbook PDF file may be viewed/downloaded from

[https://mycapitol.captechu.edu/ICS/icsfs/Student\\_Handbook\\_2018-19\\_FINAL\\_with\\_Cover.pdf?target=c782b1db-dbba-4f4e-87a4-41c40bb3dd28](https://mycapitol.captechu.edu/ICS/icsfs/Student_Handbook_2018-19_FINAL_with_Cover.pdf?target=c782b1db-dbba-4f4e-87a4-41c40bb3dd28).

### **Being a Good Online Learner**

- Visit <https://mycapitol.capttechu.edu> to learn about Capitol Online.
- Don't wait until the last minute for anything.
- Attend live lectures on time – set the example.
- If you have technical problems, please direct it to the CapTechU Help Desk rather than to me or to another student. Simply call or create a ticket at <http://ask.capttechu.edu/>.
- Make sure your audio and microphone work.
- Don't come to class unprepared and don't get behind.

### **Instructional Methods**

The basic modes of instruction will be live sessions, independent student study, and research learning. Live classes will be conducted with audio. Your Professor conducts the Live sessions. Live (synchronous) sessions will be used for class discussions, question and answer periods, and student reports/presentations.

Make sure that you take the time to familiarize yourself with the software and instructions that were provided by the University and Zoom. If you have any technical questions about Capitol On-Line or Zoom and your system, contact the Help Desk staff.

### **Live Sessions**

**Professors conduct the Live Sessions. All students are expected to attend the Live "synchronous Sessions."**

Live "synchronous sessions" are intended to clarify and strengthen the material you have covered in your scheduled reading and other assignments. It is expected that you will complete these assignments prior to Live Sessions. These assignments are not ends in themselves. Instead, they are a means to focus your learning of the major issues. An active rather than passive role by students is essential in "online" education. The sessions will consist of a presentation, discussion, and review of assigned material.

Discussions will focus upon those areas and issues where comprehension is substantially enhanced by additional elaboration or illustration and those of a controversial nature. I will attempt to emphasize the points and factors, which are most important and, in this way, focus on the prescribed learning objectives for this course.

**Capitol Live! (Zoom)** has full-time "live mic" capability. Please keep the following in mind:

1. Only one person should "speak" at a time.
2. Students should raise their "electronic hand" as if they were in a classroom. The Professor will call on students who have raised their hand to make a comment or ask a question. Questions/comments will be addressed in the order they were received.
3. Zoom also has text "chat" capability. When using text, chat enter your comment in short phrases. If you want to comment or ask a question, simply send a "Text chat" message to me or raise your "electronic" hand.
4. Following these rules will assist in making the eLearning environment as productive as possible.