COMPUTER SCIENCE 303
COMPUTER ALGORITHMS
Spring 2014

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Goal:

The goal of this course is to introduce the fundamentals of algorithm analysis and design. You will be able to analyze the correctness and the efficiency of algorithms as well as design fine algorithms and data structures for practical problems.

Text and Software:

The text is *Introduction to algorithms, 3rd ed.*, by *Cormen, Leiserson, Rivest, and Stein*. A reference text (not required) is *Algorithms* by *Dasgupta, Papadimitriou,* and *Vazirani*.

Course Outline:

We will cover 23 chapters (out of 35 chapters total) in the textbook. We can't study the following chapters because of time constraints or pre-requisites such as probability theory: 5, 9, 10,14, 17-21, 27,28,30,31, and 34-35. I hope to cover chapters 1-4,6-8, and 11 by the time of the first exam (see below), and chapters 13,15-16, 22-24 by the time of the second exam (see below). The final will be comprehensive. Note this is a Computer Algorithms course. It is the core of computer science and serves as the bridge to most other sciences. You will realize that somewhat abstract ideas turn out to be highly useful in real applications. After this class, you will be able to analyze the asymptotic performance of algorithms and demonstrate a familiarity with major algorithms and data structures. We will use many classical problems to give you exposures to the applications of algorithms. To fully benefit from what we do in class, you need to read the text before and after class. We probably won't have time to go through the proofs of correctness on algorithms, you should read the proofs in the text by yourself.

Office Hours: M/W/F 9:30-10:30, T/Th 2:30-4:00

Note: You should feel free to drop by as long as my door is open and I am not in a meeting. I am usually in my office between 9:30 am and 4:00 pm if I don't have a class or a committee meeting. If you want to guarantee that I will be in at a time other than office hours, you only need to make an appointment.

Homework/Programming Assignments:

Homework problems at the end of each section will be assigned on a chapter basis. We have 9 assignments grouped by 2 or 3 chapters for the whole semester. I'll make solutions available after they are due. All homework are due in class on the due date. All homework is due before 12 o'clock midnight on the announced date. No work will be accepted unless it is due to documented emergency. A list of homework problems is given at the end of this syllabus.

There are three programming assignments throughout this semester. You will have approximately 3 weeks to finish each of them. Detailed instructions on programming assignments will be posted on ANGEL later this semester.

Web:

Course information is available on ANGEL, the official distant learning website at Ashland University (https://angel.ashland.edu/). You should have been enrolled automatically and we will use it quite extensively. I'll post homework solutions, announcements, lecture notes, and other course related information there.

Exams/Projects/Grades:

We will have two in-class exams and a comprehensive take-home final. Exam 1 will cover chapters 1-4,6-8, and 11 and exam 2 will cover chapters 13,15-16, 22-24. Each exam is worth 100 points. The final is worth 150 points. You may bring a 3x5 card with notes written on one side to each exam and the final. The programming assignments are worth 150 points (together). Homework is worth 150 points. I'll drop the lowest homework score from your grade. Course grades are based on total points earned. The final letter grade will be given according to the following distribution.

Grade	Total Points (% range)				Grade	Total Points (% range)			
A	611 -	650 (	94% -	100%)	C	475 -	500 (	73% -	76%)
A-	585 -	610 (	90% -	93%)	C-	455 -	474 (	70% -	72%)
B+	566 -	584 (	87% -	89%)	D+	436 -	454 (	67% -	69%)
B	540 -	565 (	83% -	86%)	D	410 -	435 (	63% -	66%)
B-	520 -	539 (	80% -	82%)	D-	390 -	409 (	60% -	62%)
C+	501 -	519 (	77% -	79%)	F	0 -	389 (	0% -	59%)

Exam Schedule:

Exam 1, Friday, Feb. 21 (tentative)
Exam 2, Monday, Apr. 7 (tentative)
Final – take home, due May 5, Monday by 12 noon (definite)

Honor Code

All work that you hand in must be signed with the Ashland Honor Code according to the student handbook, "I affirm that I have adhered to the Honor Code on this assignment." The pledge should also be typed in any electronically submitted work. Working together on assignments or labs is **not allowed**. Examples of violations of academic integrity include: copy other student's work, collaborate on homework or labs, request assistance online or from other resources other than the instructor, etc. I hope none of this will happen in this course. However, should any academic integrity violation occur, the violator will automatically receive an F for this course and the incident will be reported to the academic integrity council. You should feel free to ask me any question about any assignment or lab.

Homework List:

Homework is due in class on the due date. You can expect homework solutions on ANGEL as well as your graded work back within a week after the due date. Problems with P in the front are problems at the end of the chapter. The weight of each assignment is determined by the number of points in that assignments, usually proportional to the number of questions in that assignment.

Assignment 1 (due 01/24, Fri.)

Chapter 2 :
2.1-1, 2.1-3, 2.2-1, 2.2-3, 2.3-1, 2.3-3
Chapter 3:
3.1-1, 3.1-4, 3.1-7, 3.2-1, P. 3-2, P. 3-3

Assignment 2 (due 02/12, Wed.)

Chapter 4:
4.1-1, 4.1-2, 4.2-1, 4.3-1, 4.3-2, 4.3-3, 4.4-1, 4.4-3, 4.5-1
Chapter 6:
6.1-3, 6.1-4, 6.1-6, 6.2-1, 6.2-3, 6.2-5, 6.3-1, 6.4-3
Chapter 7:
7.1-1, 7.2-1, 7.2-2, 7.4-2

Assignment 3 (due 02/19, Wed.)

Chapter 8:
8.1-1, 8.2-1, 8.2-2, 8.3-1, 8.3-2
Chapter 11:
11.1-1, 11.2-2, 11.2-3, 11.3-1, 11.4-1

Assignment 4 (due 02/28, Fri.)

Chapter 12:
12.1-1, 12.1-4, 12.2-1, 12.2-5, 12.3-2
Chapter 13:
13.1-1, 13.1-2, 13.1-6

Assignment 5 (due 03/19, Wed.)

Chapter 15:
15.1-2, 15.2-1,
Chapter 16:
16.1-1, 16.1-2, 16.2-1, 16.3-3

Assignment 6 (due 03/26, Wed.)

Chapter 22:
22.1-1, 22.1-2, 22.1-3, 22.2-1, 22.2-2, 22.2-7, 22.3-2, 22.3-4, 22.4-1
Chapter 23:
23.1-3, 23.2-1, 23.2-2

Assignment 7 (due 04/02, Wed.)

Chapter 24:
24.1-1, 24.2-1, 24.2-2, 24.3-1, 24.3-2

Assignment 8 (due 04/14, Mon.)

Chapter 25:
25.1-1, 25.1-2, 25.2-1, 25.2-2
Chapter 26:
26.1-1, 26.1-3, 26.2-2, 26.2-3, 26.2-4, 26.3-1

Assignment 9 (due 04/30, Wed.)

Chapter 29:
29.3-5, 29.3-6
Chapter 33
33.4-1

Attendance:

Attendance in this course is required. You are expected to attend each lecture and to be in class on time. In case of an absence, you must provide a documented excuse of absence or get my consent. Excessive (more than 4) unexcused absences will result in a warning and 1% off the final total percentage.

Since it is quite possible that our classes may be affected by snow, we will use Webex online classroom to have our classes in case it snows too hard for our class to meet in classroom. However, this alternative will be kept minimum.

Students with Disabilities:

Ashland University makes every effort to comply with the Americans with Disabilities Act. A student who has a specific physical, psychiatric or learning disability and requires accommodations is encouraged to inform their instructor of their needs early in the semester so that learning needs can be appropriately met. It is the student's responsibility to document the disability with Disability Services in The Center for Academic Support on the 7th floor of the Ashland University Library, (419) 289-5904.

CS303 – Algorithms					
Week	Date	Lecture #	Topic	HW Due	Readings
#1	01/06/2014, Mon		Snow Cancellation		
	01/07/2014, Tue				
	01/08/2014, Wed	1	Syllabus, introduction to algorithm		Ch 1
	01/09/2014, Thu				
	01/10/2014, Fri	2	Analysis of algorithm efficiency (insertion sort), correctness of algorithms)		2.1-2.2
	01/11/2014, Sat				
	01/12/2014, Sun				
#2	01/13/2014, Mon	3	Merge sort, Asymptotic notation		2.3, 3.1
	01/14/2014, Tue				
	01/15/2014, Wed	4	Asymptotic notations properties		3.1-3.2
	01/16/2014, Thu				
	01/17/2014, Fri	5	Recursion properties		Appendix A
	01/18/2014, Sat				
	01/19/2014, Sun				
#3	01/20/2014, Mon		MLK – no class		MLK – no class
	01/21/2014, Tue				
	01/22/2014, Wed	6	Analysis of non-recursive algorithms, substitution method for recursion analysis		4.3
	01/23/2014, Thu				
	01/24/2014, Fri	7	Recurrence tree	HW1 for ch 2-3	4.4
	01/25/2014, Sat				
	01/26/2014, Sun				
#4	01/27/2014, Mon	8	More recurrence tree / Master theorem		4.5
	01/28/2014, Tue				
	01/29/2014, Wed	9	Efficiency analysis exercise class		
	01/30/2014, Thu				
	01/31/2014, Fri	10	Divide and conquer – max subarray,strassen's algorithm for matrix multiplication		4.1-4.2
	02/01/2014, Sat				
	02/02/2014, Sun				
#5	02/03/2014, Mon	11	Heap sort		Ch 6
	02/04/2014, Tue				
	02/05/2014, Wed	12	Quick sort		Ch 7
	02/06/2014, Thu				
	02/07/2014, Fri	13	Quicksort efficiency and lower bound		Ch 7
	02/08/2014, Sat				
	02/09/2014, Sun				
#6	02/10/2014, Mon	14	Counting sort and radix sort		8.2-8.3
	02/11/2014, Tue				
	02/12/2014, Wed	15	Hashing	HW2 for ch 4,6,7	11.1-11.2
	02/13/2014, Thu				
	02/14/2014, Fri	16	More hashing		11.3-11.4
	02/15/2014, Sat				
	02/16/2014, Sun				
#7	02/17/2014, Mon	17	Hashing functions / BST		12.1-12.3
	02/18/2014, Tue				
	02/19/2014, Wed	18	Exercise class for exam 1	HW3 for ch 8, 11	
	02/20/2014, Thu				
	02/21/2014, Fri		Exam 1		Ch 1-4, 6-8, 11
	02/22/2014, Sat				
	02/23/2014, Sun				
#8	02/24/2014, Mon	19	Red-black tree		13.1-13.2
	02/25/2014, Tue				
	02/26/2014, Wed	20	Dynamic programming – rod cutting		15.1, 15.3
	02/27/2014, Thu				
	02/28/2014, Fri	21	DP – matrix chain multiplication	HW4 for ch 12, 13	15.2
	03/01/2014, Sat				
	03/02/2014, Sun				
#9	03/03/2014, Mon		Spring break – no class		Spring break – no class
	03/04/2014, Tue		Spring break – no class		Spring break – no class
	03/05/2014, Wed		Spring break – no class		Spring break – no class
	03/06/2014, Thu		Spring break – no class		Spring break – no class
	03/07/2014, Fri		Spring break – no class		Spring break – no class
	03/08/2014, Sat				
	03/09/2014, Sun				
#10	03/10/2014, Mon	22	Sequence alignment		15.4
	03/11/2014, Tue				
	03/12/2014, Wed	23	Sequence alignment cont		15.4
	03/13/2014, Thu				
	03/14/2014, Fri	24	Greedy algorithms		Ch 16
	03/15/2014, Sat				

CS303 – Algorithms					
Week	Date	Lecture #	Topic	HW Due	Readings
	03/16/2014, Sun				
	03/17/2014, Mon	25	Graph representation and MST		Appendix B and ch 23
	03/18/2014, Tue				
	03/19/2014, Wed	26	Graph representation and MST	HW5 for ch 15, 16	Appendix B and ch 23
#11	03/20/2014, Thu				
	03/21/2014, Fri	27	BFS and DFS		22.2-22.3
	03/22/2014, Sat				
	03/23/2014, Sun				
	03/24/2014, Mon	28	Shortest path – Dijstra's algorithm		24.3
	03/25/2014, Tue				
	03/26/2014, Wed	29	Bellman-ford	HW6 for ch 22-23	24.1
#12	03/27/2014, Thu				
	03/28/2014, Fri	30	All pair shortest path – and matrix multiplication, Floyd-Warshal algorithm		25.1-25.2
	03/29/2014, Sat				
	03/30/2014, Sun				
	03/31/2014, Mon	31	Johnson's algorithm, transitive closure		25.2-25.3
	04/01/2014, Tue				
	04/02/2014, Wed	32	Max flow	HW7 for ch 24	26.1-26.2
#13	04/03/2014, Thu				
	04/04/2014, Fri	33	Exercise class for exam 2		
	04/05/2014, Sat				
	04/06/2014, Sun				
	04/07/2014, Mon		Exam 2		13,15,16,22-24
	04/08/2014, Tue				
	04/09/2014, Wed	34	Application of max flow		26.3-26.4
#14	04/10/2014, Thu				
	04/11/2014, Fri	35	Linear programming		Ch 29
	04/12/2014, Sat				
	04/13/2014, Sun				
	04/14/2014, Mon	36	Linear programming	HW8 for ch 25-26	Ch 29
	04/15/2014, Tue				
	04/16/2014, Wed	37	String matching – Horspool, BM		Extra
#15	04/17/2014, Thu		Easter break – no class		Easter break – no class
	04/18/2014, Fri		Easter break – no class		Easter break – no class
	04/19/2014, Sat				
	04/20/2014, Sun				
	04/21/2014, Mon	38	String matching – Rabin-karp		32.2
	04/22/2014, Tue				
	04/23/2014, Wed	39	Convex hull		33.3
#16	04/24/2014, Thu				
	04/25/2014, Fri	40	Shortest distance		33.4
	04/26/2014, Sat				
	04/27/2014, Sun				
	04/28/2014, Mon	41	NP Completeness intro		Ch 34
	04/29/2014, Tue				
	04/30/2014, Wed	42	Final review	HW9 for 29, 33	Last day of class
#17	05/01/2014, Thu				
	05/02/2014, Fri				
	05/03/2014, Sat				
	05/04/2014, Sun				