WICHITA STATE UNIVERSITY

CS 721: Advanced Algorithms/Analysis
Spring 2018

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Office Hours:	Tuesdays and Thursdays 4:00 PM - 5:00 PM
Classroom; Days/Time:	261 Jabara; Tuesdays and Thursdays 7:05 PM – 8:20 PM
Prerequisites:	CS 560: Design and analysis of algorithms
Teaching Assistant:	TBA
TA Contact Info:	TBA

How to use this syllabus

This syllabus provides you with information specific to this course, and it also provides information about important university policies. This document should be viewed as a course overview; it is not a contract and is subject to change as the semester evolves.

Course Description

Topics include height-balanced trees, graph algorithms, greedy algorithms, dynamic programming, hard problems, and approximation algorithms. 3.000 Credit hours.

Definition and Assignment of Credit Hours

A "credit hour" is a measure of graduate or undergraduate academic work represented in intended learning outcomes and verified by evidence of student achievement that reasonably approximates not less than one hour of classroom or direct faculty instruction[1] and a minimum of two hours of out-of-class student work for each week of instructional time for approximately fifteen weeks for one semester, or an equivalent amount of work over a different amount of time. This unit of measure, commonly referred to as the "Carnegie unit," is a reasonable approximation of a minimum amount of student work for an on-campus course.

Success in this 3 credit hour course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally 3 hours per unit per week with 1 of the hours used for lecture) for instruction and preparation/studying or course related activities for a total of 135 hours.

Measurable Student Learning Outcomes: Undergraduate level

1. To introduce principles and techniques of computational complexity.
2. To learn the standard techniques for developing various algorithms.
3. Develop ability to design efficient algorithms.
4. Develop ability to prove correctness and evaluate efficiency of algorithms.
5. Continuum to topics covered in CS 560: Data Structures and Algorithms II.

Measurable Student Learning Outcomes: Graduate level

After passing this course, students will be able to define, understand, and apply:

1. All the undergraduate learning outcomes (see above)
2. Perform state-of-the-art literature and practice search on advanced topics in algorithms analysis and design.

Textbook

Cormen et. al., Introduction to Algorithms, The MIT Press; third edition
ISBN-10: 0262033844, ISBN-13: 978-0262033848

[1] A class hour at Wichita State University is typically 50 minutes.

Class Protocol

- The primary method of instruction will be through class lectures and in class discussions. Students are expected to utilize the computer labs for the assigned programming projects, if any.
- The daily lecture and activity schedule will be posted on *Blackboard*. It's the responsibility of the students to monitor this resource regularly. Course material, assignment, and exam related deadlines would be posted there.
- Attendance in lectures and other class activities (lecture periods, tests, examinations, or other scheduled meetings) is required of every student. The attendance record begins with the first meeting of the class, and one who registers late is responsible for class work missed.
- It is the responsibility of the students to make up for the missed classes.
- Students are highly encouraged to raise and discuss with the instructor any problem/difficulty faced in the class, including understanding the covered material.
- Course related updates and modification would be typically posted on the course web page.
- Please turn off sound on wireless phones, laptops, PDAs, and any other noise making devices. It is expected that students would use such devices, if at all, for the class related activities.

Grading Scale

Students will be evaluated, and assigned final grades, based on their performance on examinations, assignment, and class participation, as follows:

- Exams: 60% (all the exams are equally weighed)
- Assignments: 35% (all the assignments are equally weighed)
- Class participation: 5%

WSU uses a +/- grading scale for final grades and to calculate grade point averages. In this class, grades are assigned according to the following distribution:

Percentages	Letter grade	Grade Points	Interpretation
[93, 100]	A	4.00	*The A range denotes excellent performance.*
[90, 93)	A-	3.7	
[87, 90)	B+	3.3	
[83, 87)	B	3.00	*The B range denotes good performance.*
[80, 83)	B-	2.7	
[77, 80)	C+	2.3	
[73, 77)	C	2.00	*The C range denotes satisfactory performance.*
[70, 73)	C-	1.7	
[67, 70)	D+	1.3	
[63, 67)	D	1.00	*The D range denotes unsatisfactory performance.*
[60, 63)	D-	0.7	
[0, 60)	F	0.00	*F denotes failing performance.*

(Note, other classes might assign grades differently. Be sure to understand the different grading scales in all of your classes.)

Assignments

There will be approximately seven assignments, including programming projects. The exam dates will be announced on blackboard at least a week in advance.

Assignment 1: Big O (see Undergrad Outcomes 1, 3, 4, and 5)
Assignment 2: Graph search (see Undergrad Outcomes 1, 3, and 5)
Assignment 3: Greedy Algorithms (see Undergrad Outcomes 2 and 3)

Assignment 4: Dynamic Programming (see Undergrad Outcomes 2 and 3)
Assignment 5: Programming Binary Search Tree (see Undergrad Outcomes 1, 3, and 5)
Assignment 6: Linear programming/NP-Completeness (see Undergrad Outcomes 3 and 4)
Assignment 7: NP-Completeness (see Undergrad Outcomes 2, 3 and 4)
Assignment Grad: Survey (see Grad Outcome 2)

Late Assignments

All the assignments must be turned in on the due dates, which will be announced on the course web page at least a week in advance before a particular assignment is out. Consideration of late assignment and the associated penalty is completely at the instructor's discretion. Students are well advised not to engage in late assignment practices. The basic assumption should be that any overdue assignments would not be assessed and given credits.

Exams

There will be approximately four exams. All exams must be attempted. The exams are expected to be conducted during the regular class hours. The exam dates will be announced on the course web page at least a week in advance.

Missed Exams

No makeup exams; exception can be made in case of emergency or documented illness. In such situations, the involved student must inform the instructor at the first available chance; however, the final decision is at the discretion of the instructor.

UNIVERSITY POLICIES

Inclusive Excellence

Wichita State University is committed to achieving "Inclusive Excellence" and institutional strength through curricula, co-curricula, and other practices, which promote and encourage the intermingling of its students, faculty, and staff from different backgrounds, in a challenging intellectual and multicultural climate that is marked by respect and appreciation for the spectrum of human diversity. The University is also committed to an "all-inclusive" diversity and does not discriminate on the basis of race, ethnicity, gender, gender identity/expression, sexual orientation, age, socioeconomic status, disability, religion, national origin, or military status.

Academic Integrity

Students are responsible for knowing and following the Student Code of Conduct http://webs.wichita.edu/inaudit/ch8_05.htm and the Student Academic Honesty policy http://webs.wichita.edu/inaudit/ch2_17.htm.
Students are not to take credit for someone else's ideas (where no mutual exchange occurred), nor are they to take credit for someone else's written work. Credit must be given to the rightful author for the use of all work (including Internet resources) that is not the student's. Any violation of this is considered a breach of professional computer science ethics. All parties collaborating in the plagiarism process are equally liable. Evidence of professional misconduct (plagiarism) will result in the following consequence:

- First Offense - receive a zero (0) for the assignment and/or the final grade will be downgraded by one letter grade, whichever is more severe.
- Second and Subsequent Offenses – Failing grade in the course and the case reported to the department/university for a further action.

Disabilities

If you have a physical, psychiatric/emotional, or learning disability that may impact on your ability to carry out assigned course work, I encourage you to contact the Office of Disability Services (DS). The office is located in Grace Wilkie Annex, room 150, (316) 978-3309 (voice/tty). DS will review your concerns and determine, with you, what academic accommodations are necessary and appropriate for you. All information and documentation of your disability is confidential and will not be released by DS without your written permission.

Counseling & Testing

The WSU Counseling & Testing Center provides professional counseling services to students, faculty and staff; administers tests and offers test preparation workshops; and presents programs on topics promoting personal and professional growth. Services are low cost and confidential. They are located in room 320 of Grace Wilkie Hall, and their phone number is (316) 978-3440. The Counseling & Testing Center is open on all days that the University is officially open. If you have a mental health emergency during the times that the Counseling & Testing Center is not open, please call COMCARE Crisis Services at (316) 660-7500.

Shocker Alert System

Get the emergency information you need instantly and effortlessly! With the Shocker Alert System, we will contact you by email the moment there is an emergency or weather alert that affects the campus. Sign up at www.wichita.edu/alert.

Student Health Services

WSU's Student Health clinic is located in Ahlberg Hall. Hours are 8:00am to 4:00pm (3:00pm on Fridays), though the clinic may be closed occasionally on Wednesdays from noon to 1:30pm. In addition to outpatient and preventive care (including immunizations, a prescription service, and testing/counseling for sexually transmitted infections), Student Health can handle minor injuries. All services are confidential. For more information see www.wichita.edu/studenthealth.

The Heskett Center and Campus Recreation

Whether you are wanting to be active on campus, relieve the stress from classes or take care of your body, Wichita State Campus Recreation is the place for you. Campus Recreation, located inside the Heskett Center, contributes to the health, education, and development of Wichita State University students, faculty, staff, alumni, and community members by offering quality programs and services. With many programs and facilities which are free to all students and members, Campus Recreation offers its members limitless opportunities. For more information about our services see www.wichita.edu/heskett.

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Tentative Schedule

Important Academic Dates

Please consult the university's web site for important dates:
http://webs.wichita.edu/?u=REGISTRAR&p=/academic_calendar/

CS 721, Advanced Algorithms/Analysis, Spring 2018

Order	Topics
1	Syllabus, Introduction, Big O notations
2	Graphs, DFS, BFS, ...
3	Shortest Path (single source, all pairs),
4	Greedy Programming: Activity Scheduling and Huffman Prefix Code, MSTs
5	Dynamic Programming: Matrix Chain Multiplication and Longest Common Subsequence, Edit distance
6	Binary Search Trees, AVL/Red Trees
7	Linear Programming
8	NP-Completeness:1
9	NP-Completeness: 2
10	Approximation Algorithms
11	Network Flow and Matching
12	Computational Geometry