

Department of Computer Science

1803 Avenue I Suite 214, Academic Building One

N/A

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COURSE SYLLABUS

COSC 5319.01 (CRN: 21783) **Algorithm Design and Analysis 3** Credit hours Spring 2018

Location:

Class lectures: Labs:

TBD (e.g., Conference room, AB1#202)

Meeting time:

Class lectures: Labs:

TBD (e.g., One and a half hour between TuTh 11:00am and 12:20pm) N/A

Instructor:

Name:	Hyuk Cho, Ph.D.
Office:	AB1 #216H
Office hours:	TuTh 09:00–10:30am
	(Other times can be available by appointment. It is subject to change.)
Advising hours:	TuTh 10:30–10:50am
-	(Other times can be available by appointment.)
Phone:	(936) 294-1535
Email:	hyukcho@shsu.edu
URL:	http://www.shsu.edu/~hxc005/

Teaching Assistant:

Name:	N/A
Office:	N/A
Email:	N/A
Office hours:	N/A

Course description:

A number of important concepts and algorithms, with emphasis on correctness and efficiency, are reviewed. The advanced treatment of sorting, searching, hashing, and dynamic storage management is provided. Advanced data structures, such as advanced tree structures, graphs, and networks, are introduced. Applications to distributed file structures, database management systems, internet/intranetworks-are covered. Credit 3.

Course objectives: Designing and analyzing computer algorithms for a given computational problem are the fundamental subjects of Computer Science. Given a problem, we first want to find what an algorithm can solve the problem (i.e., finding an algorithm). Then, we want to prove that the algorithm can solve the given problem correctly (i.e., proving the correctness). Otherwise, we want to prove that we cannot solve the problem any faster. Designing and analyzing algorithms for a computational problem requires the clear understanding of the considered problem (i.e., domain knowledge) and a thorough knowledge of data structures that are currently available and suitable/applicable to the problem. This course will discuss the above problems as follows. First, fundamental data structures

learned in undergraduate programming and data structure courses will be reviewed. Then, various techniques for designing and analyzing algorithms will be discussed. Topics will be including but not limited to asymptotic analysis, recurrences and divide-and-conquer algorithms, greedy algorithms, dynamic programming, graph algorithms, and randomized algorithms. Finally, computational complexity theory and computability will be briefly discussed.

- Prerequisite:The following knowledge is essential: Programming Fundamentals, Data Structure,
Discrete Mathematics, and Mathematical Reasoning.
- Textbooks (optional):
 (1) Introduction to Algorithms (3rd Edition), Cormen, Leiserson, Rivest, and Stein

 (2) Algorithms (4th edition), Sedgewick and Wayne
 (3) Algorithm Design, Kleinberg and Tardos

 (4) Introduction to The Design and Analysis of Algorithms, Analysis, Statement, Statemen
 - (4) Introduction to The Design and Analysis of Algorithms, Anany Levitin
 - (5) Algorithms, Dasgupta, Papadimitrious, and Vazirani

Instructor's Objectives (for IDEA):

- (1) To gain factual knowledge (terminology, classifications, methods, etc.)
- (2) To learn fundamental principles, generalizations, or theories

Academic Calendar (for Spring 2018):

http://www.shsu.edu/~reg_www/academic_calendar/

Weekly schedule: The following is preliminary and subject to change. Any updates or changes will be announced at least one week in advance. Lecture slides and other supporting materials will be available gradually in Blackboard, following the schedule.

(**NOTE**) If time allows, special topics (on current issues such as Data Science, Big Data Analytics, Deep Learning, Apache Spark, etc.) will be briefly introduced.

Week	Topics	Chapters
01	Introduction; Review/Preview of Fundamentals I	Handouts
02	Review/Preview of Fundamentals II	Handouts
03	Review/Preview of Fundamentals III	Handouts
04	Recurrences; Divide & Conquer Algorithms; Asymptotic Notation	CLRS 2, 3, 4(1-2) SW 1.4, 2.2
05	Master Method	CLRS 4(4-6), 7 SW 2.3
06	Sorting and Searching I	CLRS 9 SW 4
07	Sorting and Searching II	CLRS 9 SW 4
08	Graph Algorithms I	CLRS 22 SW 3, 4
09	Graph Algorithms II	CLRS 6, 11-13, 24(3-4) SW 4, 5
10	Greedy Algorithms	CLRS 16, 21, 23 SW 4, 5
11	Dynamic Programming I	CLRS 15
12	Dynamic Programming II	CLRS 24(1), 25
13	P, NP, and NP-complete Problems	CLRS 34
14	Greedy and Dynamic Programming Heuristics	CLRS 35(1-3)
15	Review	

Course requirements:

Attendance:

Attendance of both lectures and labs are required and counted to 10% of whole grade. The roster will be circulated at the beginning of each lecture and lab; thus, please come to the class on time and give your signature on the roster. If you are continuous absent from two classes, you will be reported to the SAM Center via <u>FirstAlert</u>.

Reading: Reading assignment of lecture slide(s) and supplementary materials will be timely announced in the class and/or posted on Blackboard in advance.

- Labs: N/A
- Quizzes: From time to time, lectures will start (or end up) with a brief quiz (5-10 minutes), focusing on fundamentals in data structures and algorithms. The nature of questions will be discussed during each lecture, so students will only need to remember a small amount of material for each quiz.
- Assignments: Assignments will be given periodically (almost every week). Unless otherwise mentioned, each homework assignment should be turned in class (or in Blackboard) on the due date (usually one week after each homework announcement). Late homework is accepted up to the beginning of the next lecture class with a penalty of 50% off of the specified points. Without the prior permission, no further extension will be given. Graded homework and exam papers will be returned back to students usually within one week from the due date. Also, students are required to ask questions or corrections on each graded paper within one week after each posting.
- Exams: Three written exams are planned. Exam date will be announced and posted in Blackboard at least one week prior to each exam. There is no make-up examination available for any students. Students who fail to take one of the three exams will fail the class automatically unless excused for good cause by the college Dean.

Grading plan & criteria	 (1) Attendance (2) Quizzes (3) Assignments (4) Labs (5) First exam (6) Second exam (7) Final exam 	10% 10% 30% 00% 15% (Date TBA) 15% (Date TBA) 20% (Date TBA)
	TOTAL	100%
	Finally, 90% \leq TOTAL \leq 100% \Rightarrow	"A"
	$80\% \leq \text{TOTAL} < 90\% \Rightarrow$	"В"
	$70\% \leq \text{TOTAL} < 80\% \Rightarrow$	"С"
	$60\% \leq \text{TOTAL} < 70\% \Rightarrow$	"D"
	$0\% \leq \text{TOTAL} < 60\% \Rightarrow$	" F "

- **Visitors in the classroom:** Occasion visiting of classes by responsible persons is allowed with prior arrangement with the instructor, as long as it does not interfere with the registered members of the class or the educational process.
- **Rules of conduct:** Students will refrain from behavior in the classroom that intentionally or unintentionally disrupts the learning process and, thus impedes the mission of the university. Please turn off or mute your cellular phone and/or pager before class begins. Students are prohibited from eating in class, using tobacco products, making offensive remarks, reading newspapers, sleeping, talking among each other at inappropriate times, wearing inappropriate clothing, or engaging in any other form of distraction. Inappropriate behavior in the classroom shall result in a, minimally, a directive to leave class or being reported to the Dean of Students for disciplinary action in accordance with university policy.
- Class participation: In accordance with University Policy, regular attendance is required and your attendance will be seriously monitored (<u>http://www.shsu.edu/students/guide/polpro/attendance.html</u>). So, don't forget to give your signature on the roster. You are responsible for all material

covered in classes and labs, regardless of whether you attended or not. It is your responsibility to obtain class materials from fellow classmates if you miss a class.

Academic dishonesty: All students are expected to engage in all academic pursuits in a manner that is above reproach. Students are expected to maintain complete honesty and integrity in the academic experiences both in and out of the classroom. Any student found guilty of dishonesty in any phase of academic work will be subject to disciplinary action. The university and its official representatives may initiate disciplinary proceedings against a student accused of any form of academic work which is to be submitted, plagiarism, collusion and the abuse of resource materials. No cheating on an examination or assignments is allowed. A score of zero will be given to the student if such a case occurs.

Other administrative matters:

Students with Disabilities Policy: It is the policy of Sam Houston State University that individuals otherwise qualified shall not be excluded, solely by reason of their disability, from participation in any academic program of the university. Further, they shall not be denied the benefits of these programs nor shall they be subjected to discrimination. Students with disabilities that might affect their academic performance should register with the Office of Services for Students with Disabilities located in the Lee Drain Annex (telephone 936-294-3512, TDD 936-294-3786, and e-mail <u>disability@shsu.edu</u>). They should then make arrangements with their individual instructors so that appropriate strategies can be considered and helpful procedures can be developed to ensure that participation and achievement opportunities are not impaired.

SHSU adheres to all applicable federal, state, and local laws, regulations, and guidelines with respect to providing reasonable accommodations for students with disabilities. If you have a disability that may affect adversely your work in this class, then I encourage you to register with the SHSU Services for Students with Disabilities and to talk with me about how I can best help you. All disclosures of disabilities will be kept strictly confidential. NOTE: No accommodation can be made until you register with the Services for Students with Disabilities. For a complete listing of the university policy, see: http://www.shsu.edu/dept/academic-affairs/documents/aps/students/811006.pdf

<u>Religious Holidays:</u> An institution of higher education shall excuse a student from attending classes or other required activities, including examinations, for the observance of a religious holy day, including travel for that purpose. A student whose absence is excused under this subsection may not be penalized for that absence and shall be allowed to take an examination or complete an assignment from which the student is excused within a reasonable time after the absence.