CS 155: Introduction to the Design and Analysis of Algorithms

Instructor:	Yongwhan Lim
Office Location:	TBD
Telephone:	650-353-6748
Email:	yongwhan.lim@sjsu.edu
Office Hours:	Online (M 5pm-6pm)
Class Days/Time:	Online (MW 6pm-7:15pm)
Classroom:	Zoom meeting (See Canvas for link)
Prerequisites:	CS 146 or a permission from instructor

Companion Websites
To host homeworks and exams, the course will use http://vjudge.net/.

Optional Textbooks
- Introduction to Algorithms, 3rd Edition, Thomas H. Cormen, et. al.

Objectives
Upon successful completion of this course, students should be able to:
- have a full understanding of various algorithmic design techniques: greedy, divide-and-conquer, and dynamic programming
- understand the general notion of complexity classes, P and NP, completeness and hardness, and the relationships between classes by reduction
- know when to use exact, heuristic, and approximation algorithms
- understand standard approaches to geometric algorithms
- think recursively for algorithm design

Assignments
Each week will have an assignment with 12 programming exercises. Only 10 exercises need to be completed for a full mark. 2 extra exercises are for extra credit. Each problem has an equal weight. The grade for each assignment is the total points received divided by 10: any surplus will be considered an extra credit. Only 10 highest assignments will count towards the final grade. Each assignment is worth 5% of the final grade.

Exams
There will be 3 exams. Each exam has the same weight. Only **2** out of 3 highest exam scores will count towards the final grade. However, a failure to appear in the exam would result in zero points on participation grade.

The exam dates are: September 29th, November 8th, and December 6th in-class

The format of the exam will be timed (full course length: 75 minutes) and will consist of solving 5 problems out of 7 problems. Each problem will be scored in binary: 1 for a full solution and 0 for

a partial or incorrect solution. Solving a problem will contribute 20% to the exam grade (3% to the final grade).

In exceptional cases, a make-up exam will be given over the weekend in case a student had an emergency to take care of. The format of the make-up exam will be exactly the same as the exam.

Course Structure
There will be 2 lectures per week. Each lecture consists of 2 lessons of 35 minutes each and a break of 5 minutes in-between.

Determination of Grades
A+: 97% ~
A: 93% ~ 96.9%
A-: 90% ~ 92.9%
B+: 87% ~ 89.9%
B: 83% ~ 86.9%
B-: 80% ~ 82.9%
C+: 77% ~ 79.9%
C: 73% ~ 76.9%
C-: 70% ~ 72.9%
D+: 67% ~ 69.9%
D: 63% ~ 66.9%
D-: 60% ~ 62.9%
F: ~ 59.9%

Final Grade
Your grade at the end of the course will be determined by:
50%: Assignments, 5% each
30%: Exams, 15% each
20%: Participation

Attendance
University policy F69-24 at http://www.sjsu.edu/senate/docs/F69-24.pdf states that students should attend all meetings of their classes, not only because they are responsible for material discussed therein, but because active participation is frequently essential to insure maximum benefit for all members of the class.

Consent for Recording of Class and Public Sharing of Instructor Material:
University Policy S12-7, http://www.sjsu.edu/senate/docs/S12-7.pdf, requires students to obtain instructor's permission to record the course: common courtesy and professional behavior dictate that you notify someone when you are recording him/her. You must obtain the instructor's permission to make audio or video recordings in this class. Such permission allows the recordings to be used for your private, study purposes only. The recordings are the intellectual

property of the instructor; you have not been given any rights to reproduce or distribute the material. Course material cannot be shared publicly without his/her approval. You may not publicly share or upload instructor generated material for this course such as exam questions, lecture notes, or homework solutions without instructor consent.

University Policies

Per University Policy S16-9 (http://www.sjsu.edu/senate/docs/S16-9.pdf), relevant university policy concerning all courses, such as student responsibilities, academic integrity, accommodations, dropping and adding, consent for recording of class, etc. and available student services (e.g. learning assistance, counseling, and other resources) are listed on Syllabus Information web page (http://www.sjsu.edu/gup/syllabusinfo), which is hosted by the Office of Undergraduate Education. Make sure to visit this page to review and be aware of these university policies and resources. The instructor reserves the right to drop students that do not show up during the first two lectures.

Detailed Lesson Plan

Lecture 1	August 23, 2021	Introduction
Lecture 2 / Chapter 22.1-5	August 25, 2021	Elementary Graph Algorithms
Lecture 3 / Chapter 23.1-2	August 30, 2021	Minimum Spanning Trees

Lecture 4 / Chapter 24.1-4	September 1, 2021	Single-Source Shortest Paths
~~LABOR DAY~~	~~September 6, 2021~~	
Lecture 5 / Chapter 25.1-3	September 8, 2021	All-Pairs Shortest Paths
Lecture 6 / Chapter 15.1-3	September 13, 2021	Dynamic Programming I
Lecture 7 / Chapter 15.4-5	September 15, 2021	Dynamic Programming II
Lecture 8 / Chapter 16.1-3	September 20, 2021	Greedy Algorithms I
Lecture 9 / Chapter 16.4-5	September 22, 2021	Greedy Algorithms II
Lecture 10 / Chapter 17.1-4	September 27, 2021	Amortized Analysis
Exam 1	September 29, 2021	-

Lecture 11 / Chapter 30.1-2	October 4, 2021	Polynomial and the FFT I
Lecture 12 / Chapter 30.3	October 6, 2021	Polynomial and the FFT II
Lecture 13 / Chapter 31.1-6	October 11, 2021	Number-Theoretic Algorithms
Lecture 14 / Chapter 32.1-3	October 13, 2021	String Matching I

Lecture 15 / Chapter 32.4	October 18, 2021	String Matching II
Lecture 16 / Chapter 33.1-4	October 20, 2021	Computational Geometry
Lecture 17 / Chapter 34.1-2	October 25, 2021	NP-Completeness I
Lecture 18 / Chapter 34.3-5	October 27, 2021	NP-Completeness II

Lecture 19 / Chapter 35.1-3	November 1, 2021	Approximation Algorithms I
Lecture 20 / Chapter 35.4-5	November 3, 2021	Approximation Algorithms II
Exam 2	November 8, 2021	-
Lecture 21 / Chapter 27.1-3	November 10, 2021	Multithreaded Algorithms
Lecture 22 / Chapter 28.1-3	November 15, 2021	Matrix Operations
Lecture 23 / Chapter 29.1-3	November 17, 2021	Linear Programming I
Lecture 24 / Chapter 29.4-5	November 22, 2021	Linear Programming II
~~NON INSTRUCTIONAL DAY~~	~~November 24, 2021~~	
Lecture 25	November 29, 2021	Advanced Data Structures: Union-Find Disjoint Sets; Segment Tree; Binary Indexed (Fenwick) Tree;

Lecture 26	December 1, 2021	Miscellaneous Topics: 2-SAT; Lowest Common Ancestor; Sliding Window; Sparse Table; Tower of Hanoi;
Exam 3	December 6, 2021	-