Design and Analysis of Algorithms -- CS 331

Dr. Fang (Daisy) Tang
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Office Hours: M/W: 2:00pm – 4:00pm (8-11).

Time and Place: M/W/F, 11:45am -- 12:50pm, Room 8-302

Class Website: www.cpp.edu/~ftang/courses/CS331/

Class Email List: cs33102@cpp.edu

Course Description: This course will cover complexity analysis using asymptotic notation, algorithm design techniques including divide-and-conquer, the greedy method, and dynamic programming. We will also discuss theory of NP and NP-complete problems.

Prerequisites: CS 241 and MAT 208.

Required Textbook:

Exam Dates:
- Exam 1: Apr. 5 (Wednesday), class time (tentative schedule).
- Exam 2: Apr. 21 (Friday), class time (tentative schedule).
- Exam 3: May 5 (Friday), class time (tentative schedule).
- Exam 4: May 26 (Friday), class time (tentative schedule).
- Final: Take home exam.

Evaluation:
Grading will be based on exams, projects, homework, and in-class exercises.

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<th>Component</th>
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<tr>
<td>Exam 1</td>
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<td>Exam 2</td>
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<td>Projects</td>
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<td>Homework</td>
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Note that the instructor reserves the right to curve the grades upwards if it’s appropriate.
Class Policies and Support:

- **Class attendance and participation:** Class attendance and participation are expected. Please be prepared to discuss and present your solutions/ideas to the class. In the event of an absence, it is the student’s responsibility to learn the course material and announcements covered in class. Lectures will not be repeated during office hours. If you really have to miss a class, please inform the instructor ahead of time by email.

- **Collaboration policy:** Discussing and exchanging ideas is encouraged. You may help each other with your strategy for how to solve a problem. However, copying from outside sources (e.g., other students, Internet, etc.) on any material to be graded is not permitted and will be considered cheating. Cheating may result in failure of the assignment/exam and/or failure of the class. The University’s policy on Academic Integrity, as stated in the catalog, will be enforced.

- **Exams:** Unless otherwise specified by the instructor, each exam will cover a specific topic. The final exam will be held during final exam week and it will be a take home exam. The rescheduling of exams must be arranged at least one week in advance. The new schedule of the exam will be a day or two earlier than the original scheduled day. Exams missed without prior permission will be given a grade of zero.

- **Projects and Homework:** All homework assignments and programming projects are due at the beginning of class on the specified day. Late submission will NOT be accepted for homework. If you cannot complete a homework assignment by the due date, then submit whatever you have completed. Partial credit will be given for reasonable partial solutions. Late submission will be accepted for programming projects with 10 points penalty per day.

- **Grading correction:** Bring any project or exam grading correction requests to the instructor within 1 week of receiving the grade, or before the end of the quarter, whichever comes first. After that, your grade will not be adjusted. If you find a mistake in grading, please let the instructor know. Your grade will not be lowered.

- **Announcement responsibility:** Important announcements, schedule revisions, etc., will be posted to the class email list and on the course website. You are responsible for information distributed to this email list and the course website. You are also responsible for short announcement during class session.

- **Cell phones:** You may have cell phones in class, but they must be on mute and not answered until the end of class.

- **Student access:** Cal Poly Pomona is committed to student success. Students with disabilities are encouraged to contact the instructor privately or the Disability Resource Center (909-869-3333, Building 9-103) to coordinate course accommodations.
Course Outline:

Chapter 1. Introduction
What is an Algorithm
Algorithm Analysis, Complexity Measures, Asymptotic Notation
Average, Worst-case Analysis, Lower Bounds

Chapter 2. Divide-and-Conquer
The General Method
Finding the Maximum and Minimum
Mergesort
Quicksort
The Selection Problem
Integer Multiplication
Matrix Multiplication

Chapter 4. The Greedy Approach
The General Method
Minimum Spanning Trees
Single Source Shortest Paths
Huffman Code
Optimal Storage on Tapes
Knapsack
Job Sequencing with Deadlines

Chapter 3. Dynamic Programming
The General Method
Multistage Single-Sort Single-Destination Shortest Path
All Pairs Shortest Paths
Chained Matrix Multiplication
0/1 Knapsack
Optimal Binary Search Trees
The Traveling Salesperson Problem

Chapter 9. Theory of NP
“easy” vs. “hard” problems
Decision Problems, Optimization Problems
The Class of P, NP, NP-complete, NP-hard
Reductions