

## CSCE 4110: Algorithms

1. **Class Hours:** Tuesday 3:00-4:00 (Edgar and Ethan) OR Tuesday 11:30-12:30 (Zach and Rob)
2. *Course Content:* This is a first undergraduate course in the design and analysis of algorithms. The course will focus on the design strategies, on the mathematical analysis of the algorithms, and on the correctness proofs.
3. *Course Objectives:*
  - Be able to analyze the time and space complexity of a nontrivial algorithm, using mathematical tools, and prove/justify the correctness.
  - Understand the Divide and Conquer, Greedy, and Dynamic Programming strategies for algorithmic design.
  - Be familiar with the algorithms for Matrix Multiplication (Strassens), Activity Selection, Knapsack, Shortest Paths (single source, and all pairs), Minimum Spanning Tree (Prims and Kruskals), Matrix Chain, and Longest Common Subsequence problems.
  - Be exposed to approximation algorithms for solving NP-hard problems.
  - Be able to determine and measure the efficiency of a given algorithm, in practice, through different possible implementations, and by testing on suitable data sets.
  - Be able to communicate clearly and precisely in writing about the theoretical analysis of an algorithm and its efficiency in practice.
4. *Prerequisites:* Students planning to enroll in this course should have taken course numbers 3110, 2100, 2110. They should have been exposed to the following:
  - Time and space analysis; asymptotic notation
  - Basic sorting algorithms: insertion, merge and heap sort
  - Data structures including trees, heaps, BSTs, union/find data, and graphs
  - Recurrence Relations and Proof techniques
  - Graphs: BFS, DFS, MST (Prims and Kruskals algorithms)
  - Mathematical structures: Sets, relations
  - Important mathematical manipulations: Sums, combinatorics
5. *Topics:*
  - (a) Topic 1 Introduction, Review of techniques for proof, Algorithm Analysis
  - (b) Topic 2 Algorithm Analysis (continued), Sorting (Heap sort, Quicksort, Linear time Sorting)
  - (c) Topic 3 Red-Black Trees and other Data Structures
  - (d) Topic 4 Dynamic Programming (Matrix Chain Multiplication, Longest Common Subsequence)
  - (e) Topic 5 Greedy Algorithms (Huffman codes, Task Scheduling)
  - (f) Topic 6 Graph Theory (Review of BFS, DFS, Minimum Spanning Trees)
  - (g) Topic 7 Review and Midterm (on everything upto greedy algorithms)
  - (h) Topic 8 Graph Theory (Single Source Shortest Paths, All Pair Shortest Paths)
  - (i) Topic 9 Graph Theory (Maximum Flow)
  - (j) Topic 10 NP Completeness and Reducibility

(k) Topic 11 Approximation Algorithms for NP complete Problems

6. *Suggested TextBook:* Introduction to Algorithms, by Thomas H. Cormen, Charles E. Leiserson, and Ronald L. Rivest.
7. Instructor: Sanjukta Bhowmick  
Office: F291  
Email: sanjukta.bhowmick1@gmail.com **Use this email for fastest response**  
Office Hours: Monday and Wednesdays 11:30-12:30
8. Course Announcements and Assignments will be emailed and posted on Blackboard.
9. Evaluation: There will be several quizzes. These will not be graded, but will be used to assess how well the students understand the material. There will be on project worth **50%** and one exam worth another **50%**.
10. Academic Integrity Standards in this course are consistent with UNT policy: STUDENT STANDARDS OF ACADEMIC INTEGRITY (18.1.16), or other related/existing UNT policies. The work that you turn in to be graded, including any underlying ideas, must be your own individual work. Usage of unauthorized material and sources, or depending on any unauthorized assistance, to answer homework problems, tests questions, writing reports, or carrying any type of assignment, etc., without the permission of the instructor, or without complete and accurate and complete attribution/citation of the source, when applicable, is viewed as an academic misconduct.  
date.
11. The passing marks in this class is 55 or lower. Anyone getting lower than 55 will get an F