CSci 242.□ Algorithms and Data Structures

Term: Spring 2017.
Class Hours: 11:00 - 12:15 PM, TR
Room: 106 Streibel

Instructor: Dr. M. Eunjin Kim
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Office: 215 Streibel
Phone: (701)777-3338
Office Hours: 12:15 - 12:45 PM, TR and 1:00 - 3:30 PM Wed.

TA: Debesh Adhikari (debesh.adhikari@my.und.edu)
TA's Office Hour: 1:30 - 3:30 PM, Wed. (Rm. 219)

Recitation Class: 6:00 PM, Thr. (Rm. 238)

Prerequisites:
Csci 161 Computer Science II: Java
Math 208: Discrete Mathematics

Required Textbook:
Algorithm Design and Applications
Michael T. Goodrich, Roberto Tamassia
Wiley, October 2014.

Recommended Book:
Intro Introduction to Algorithms, 3rd ed.
Thomas H. Cormen et.al.
The MIT Press, 2009.

Data Structures and Algorithms in Java 6/e
Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser
Wiley, January 2014.

Course Webpage:
https://learn.aero.und.edu/index.asp.
You need to create a new account at eZ LMS if you didn't have it.

Grade Policy:

Midterm: Part I & II - 20%
Final Exam: Part III & IV (& VI). - 25%
Assignments & Quizzes: 25%
Project: 25%
Attendance: 5%

Final Grade Policy:

Midterm = y_1; Your Midterm Score = x_1;
Final Exam = y_2; Your Final Exam Score = x_2;
HW/Q Total = y_3: Your Total HW Score = x_3:
Project = y_4; Your Project Score = x_4;

Attendance = y_5. Your Attendance = x_5.

Your Total of Final Grade = $x_1/y_1*200 + x_2/y_2*250 + x_3/y_3*250 + x_4/y_4*250 + x_5/y_5*50$

A: 900 - 1000
B: 800 – 899
C: 700 - 799
D: 600 - 699
F: 0 - 599

FINAL EXAM:

1:000 PM, May 9th (Tue.) 2017.

COURSE DESCRIPTION:

The data structures and algorithms are the basic elements for problem solving and further build the large and complex software artifacts. This course provides the students with the basic theory/implementation of algorithms, the fundamental data structures, algorithm design techniques, and the analysis of algorithms. The topics include: data structures, such as trees, priority queue, heap, hash table and graph; the advanced algorithms such as sorting algorithms and graph algorithms; the algorithm design techniques such as divide-and-conquer, dynamic programming and greedy method; and the asymptotic analysis of algorithm in terms of the order of growth of the function such as upper bound (O), lower bound (Ω) and tight bound (Θ). Thus, the students are expected to have a good understanding of various data structures, algorithms for problem solving, algorithm design techniques and its analysis skill enough to design the correct and efficient algorithms for complex software artifacts.

ABET Outcome:
a) *An ability to apply knowledge of computing and mathematics appropriate to the discipline.*
i) An ability to use current techniques, skills, and tools necessary for computing practice.
j) An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.

SELECTED TOPICS:

0. Preface

Chap. 1. Algorithms Analysis

I. Data Structures

Chap. 2. Basic Data Structures
Chap. 3. Binary Search Trees
Chap. 4. Balanced Binary Search Trees
Chap. 5. Priority Queues and Heaps
Chap. 6.Hash Tables
Chap. 7.Union-Find Structures

II. Sorting and Selection

Chap. 8. Merge-Sort and Quick-Sort
Chap. 9. Fast Sorting and Selection

III. Fundamental Techniques

Chap. 10. The Greedy Method
Chap. 11. Divide-and-Conquer
Chap. 12. Dynamic Programming
Chap. 13. Graphs and Traversals

IV. Graph Algorithms

Chap. 14. Shortest Paths
Chap. 15. Minimum Spanning Trees

VI. Additional Topics

Chap. 20. B-Trees and External Memory