CMSC 57 Course Guide

Discrete Mathematics in Computer Science 2 *2nd Semester 2020-2021*

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Course Description

Asymptotic analysis, principles of linear algebra, combinatorics, probability, and graph theory

Course Learning Outcomes

1. Prove O, Ω, Θ, relationships
2. Explain asymptotic relationships are used in Computer Science
3. Explain basic concepts in Linear Algebra, including linear transformations, determinants, inverses
4. Apply counting arguments, including sum and product rules, inclusion-exclusion principle
5. Compute permutations and combinations of a set, and interpret the meaning in the context of the particular application
6. Calculate probabilities of events and expectations of random variables for elementary problems such as games of chance
7. Identify a case of the binomial distribution and compute a probability using that distribution
8. Apply Bayes theorem to determine conditional probabilities in a problem
9. Compute the variance for a given probability distribution
10. Illustrate by example the basic terminology of graph theory, as well as some of the properties and special cases of each type of graph/tree
11. Demonstrate different traversal methods for trees and graphs, including pre-, post-, and in-order traversal of trees

Course Outline

1. Asymptotic Notation
    1. Set definitions
    2. Limit definitions
    3. Asymptotic Tightness
    4. Application to Computer Science
2. Introduction to Linear Algebra
    1. Matrices and Matrix Operations
    2. Vectors and vector spaces
    3. Linear Transformations
    4. Determinants and Inverses
    5. Non-square Transformations
3. Counting and Discrete Probability
    1. Counting Techniques
    2. Permutations and Combinations
    3. Binomial Theorem and Pascals Identity
    4. Finite Probability Spaces
    5. Conditional Probability
    6. Bayes Rule
    7. Expected Value
4. Graphs and Trees
    1. Graphs and Graph Definitions
    2. Euler Circuits
    3. Trees
    4. Tree Traversals

Mode of Delivery

This course will be delivered asynchronously through lecture notes with accompanying lecture videos. This course can also be found online on VLE. We won't always have scheduled zoom sessions but you're free to setup consultation on the scheduled times for this class.

Enrolling through VLE

Look for the course Discrete Mathematics in Computer Science 2 in VLE and enroll yourself to the course. Make sure you enroll using the correct enrollment key for your section:

- Section A - **CMSC57A**
- Section B - **CMSC57B**
- Section C - **CMSC57C**

Joining the slack workspace

Make sure you join the slack workspace as soon as you can

https://join.slack.com/t/cmsc57/shared_invite/zt-ep87ayds-xfv80hXP6giSFfbH8QDzUQ

Asking Questions and Scheduling Remote Consultations

I'll try to make myself available for questions most of the time but you'll have a better chance of reaching me during our weekly schedules. You can schedule consultation as a group. Use that time to ask questions about the lecture or ask for help in answering lab exercises.

You can contact me through sms, email, slack dms, or through discord. You can find ways to reach me at the last section of this guide.

Course Materials

All of the resources in this course can be found in the course pack. The course pack includes:

- **Lecture Notes** - You'll find these files in the Lecture Notes Folder. They come in pdf form and markdown form. One of the Lecture notes in particular, Introduction to Linear Algebra, has some gifs that will not be loaded on the pdf files. You're better off opening the mark down version of this file (use a markdown viewr to open the md files)
- **Lecture Videos** - There's a link to the youtube playlist here. If you want the master copies

- **Seatworks** - Not really seatworks since you'll be doing it at home, You can find them on the textbook as well.

Study Schedule

This class is asynchronous, but if you start too late, you might end up getting overwhelmed by the amount of work. Here's the recommended schedule for completing the resources and lab exercises.

Week Number	Videos To Watch/Lecture Notes to Read	Seatworks
1	Asymptotic Analysis (Set Definitions)	
2	Asymptotic Analysis (Limit Definition)	SW (Asymptotic Analysis)
3	Asymptotic Analysis (Applications to CS)	
3	Linear Algebra (Matrices)	
5	Linear Algebra (Linear Transformations)	
6	Linear Algebra (Composition and Determinants)	SW (Introduction to Linear Algebra)
7	Linear Algebra (Inverses and Nonsquare Transformations)	
8	Counting and Discrete Probability (Counting Rules and Permuatations)	SW (Counting Rules)
9	Counting and Discrete Probability (Combinations)	SW (Permutations and Combinations)
10	Counting and Discrete Probability (Finite Probability Space)	SW (Probability)
11	Counting and Discrete Probability (Bernoulli Trials and Bayesian Theorem)	
12	Graphs and Trees (Graphs)	
13	Graphs and Trees (Trees)	SW (Graphs and Trees)

Course Requirements

There will be no exams in this course, 100% of your grades will come from the seatworks.

Lab Exercises

1. Seatwork (Asymptotic Analysis)
2. Seatwork (Introduction to Linear Algebra)
3. Seatwork (Counting Rules)
4. Seatwork (Permutations and Combinations)
5. Seatwork (Probability)
6. Seatwork (Graphs and Trees)

How to reach me

Don't share these info please

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