CSE581 Computer Science Fundamentals: Theory

Professor Anita Wasilewska

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COURSE STRUCTURE, PRINCIPLES and SYLLABUS



Course Structure

The course presents

Fundamentals of Computer Science Theoretical Foundations

divided into THREE PARTS:

- P1 LOGIC
- P2 DISCRETE MATHEMATICS, Theory of Computation

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P3 CONCRETE MATHEMATICS

Course Text Books

Book B1

Anita Wasilewska

Logics for Computer Science: Classical and Non-Classical

Springer 2018

We cover Chapter 2 (Introduction to Classical Propositional and Predicate Logic), and an OVERVIEW of parts of Chapters 3 ,4, 5. In particular we cover propositional syntax and propositional extensional semantics, classical and non-classical (Chapter 3), General Proof Systems, Hilbert Proof Systems, and discuss proofs of the Completeness of Classical Propositional Logic (Chapters 4, 5)

Course Text Books

Book B2

Harry R. Lewis and Christos H. Papadimitriou **ELEMENTS OF THE THEORY OF COMPUTATION** Prentice Hall. Second Edition.1998

We cover Chapter 1. This is Discrete Mathematics Basics segment of the course and we supplement it by adidtional Special Lectures

We also present an OVERVIEW of parts of Chapters 2, 3, 4. We discuss **Regular** and **Context Free** Languages, **Finite** and **Pushdown** Automata, and Turing Machines

Course Text Books

Book B3

R. Graham, D. Knuth, O. Patachnik

CONCRETE MATHEMATICS: A Foundations for Computer Science

Addison-Wesley Publishing Company, Third edition, 1989

We cover part of content of Chapter 1 - Recurrent and Closed Form Formulas, Repertoire Method, and some of Chapter 2 - Sums and Recurrences, and some of Chapter 4 - Number Theory

VIDEO LECTURES

We have a YOUTUBE Channel

LOGIC, THEORY OF COMPUTATION

https://www.youtube.com/channel/UCLZp06JC9yit6M_YW3XuvIw

The first 4 Video Lectures are for the **Theory of** Computation

and cover Chapter 1 to Chapter 5 of the book B2

The Logic Lectures follow and cover all Chapters of the BookB1

YOUTUBE CHANNEL

The YOUTUBE CHANNEL contains a set of professional **VIDEOS** filmed in the Stony Brook TV Studio



Please use them as a supplement to class Lectures when you study at home or if you want to learn more material than covered in class

Course Webpage www3.cs.stonybrook.edu/~ cse581

The course **Webpage** contains two kind of Lectures: Class Lectures and VIDEO Lectures for books **B1** and **B2** The Video Lectures are created especially for the Youtube Channel The VIDEO Lectures correspond, chapter by chapter to the slides used in Chapters VIDEOS created for the books **B1** and **B2**

You can use the VIDEO Lectures slides to follow the Chapters VIDEOS as they are exactly the same as slides used in the VIDEOS

Testing

There will be three tests Midterm 1, Midterm 2 and Final

Tests cover Class Lectures and Books Chapters only for the portion of material that was **covered** in class before the **dates** of respective tests

Tests will include some extra credit Problems

Students can earn up to 30 extra credits points during the semester

Tests Preliminary Schedule

MIDTERM 1 Tuesday, October 10 Fall Break October 14 - 15 MIDTERM 2 Tuesday, November 14 Thanksgiving Break November 27 - December 1 Last Day of classes December 6 FINAL during Final Period December 11 - 19

Tests PRINCIPLES

TESTS are "closed book" - no cell phones, no computers, clean desks, no extra papers, no any form of communication with other students.

Professor supervises all TESTS together with the course TAs Anybody violating these rules will have to immediately **submit** the TEST to the **Professor** and leave the class Student then will get **Opts** for the TEST and will be reported, if needed, to the **Academic Judiciary** as stated and explained the the University Academic Integrity

Statement included in the Syllabus

Grading Components

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Midterm 1 - 80pts Midterm 2 - 80pts

Final - 140pts

Tests will include some extra credit Problems

None of grades will be curved

Final Grade Computation

You can earn up to **300 points + x extra points** = color 300+x points during the semester

The **grade** will be determined in the following way: # of earned points divided by 3 = % **grade**

The % grade is translated into letter grade in a standard way as described in the course Syllabus

Final Grade Computation

The % grade is translated into a letter grade in a standard way i.e.

- 100 95 % is A
- 94 90 is **A** –
- 89 86% is B+, 85 83% is B, 82 80% is B-
- 79 76 % is C+, 75 73 % is C, 72 70 % is C-

- 69 60% is D range and
- F is below 60%

PART P1: LOGIC - from the book **B1** Approximately **4 weeks** of classes **Chapter 2**: Introduction to Classical Propositional and Predicate Logic **Relevant parts** of the following Chapters **Chapter 3**: Formal Propositional Extensional Semantics: Classical and Many Valued **Chapter 4**: General Proof Systems: Syntax and Semanti

Chapter 4: General Proof Systems: Syntax and Semantics

Chapter 5: Hilbert Proof Systems: Completeness of

Classical Propositional Logic

PART P2: Discrete Mathematics and Theory of

Computation - from the book B2 and Lecture Notes Approximately 8 weeks of classes

The **Midterm 1** is scheduled before the Fall Break for October 10 and will cover material from PART **P1** and PART **P2** covered in **class** before the Fall Break

I will have a comprehensive **REVIEW for MIDTERM 1** special lecture on Tuesday , October 8 to **prepare you** for the test

PART P2: Discrete Mathematics and Theory of

Computation - we will cover Chapter 1 of the book B2

This is the Discrete Mathematics segment of the course

We will supplement it by some additional special

Discrete Mathematics Lectures

We will post, as in the case of **Part 1**, a set of **Class** and **Video** Lectures covering chosen parts of Chapters 1- 4

of the book B2

In particular we discuss Regular and Context Free Languages, and the relationship between them Finite and Push Down Automata, respectively

PART P3: - CONCRETE MATHEMATICS

- from the book **B3** and special Lecture Notes

The book **B3** Concrete Mathematics: A Foundations for

Computer Science introduces the mathematics that

supports advanced computer programming and the

analysis of algorithms

It is both a **partner** to *abstract* mathematics and a **blending** of *continuous* and *discrete* mathematics

It is **defined** in the book as "a controlled manipulation of (some) mathematical formulas using a collection of techniques for **solving problems**"

PART P3: CONCRETE MATHEMATICS

- from the book B3 and special Lecture Notes

Approximately 3 weeks of classes

We will cover content of Chapter 1: Recurrent and Closed Form Formulas, Repertoire Method, **some** of Chapter 2:Sums and Recurrences, Finite and Infinite Calculus, Infinite Sums , and **some** of Chapter 4 : Number Theory

Original textbook was an extension of "Mathematical Preliminaries" part of **D. Knuth** book ART OF COMPUTER PROGRAMMING

Concrete Mathematics is supposed to help student (and hopefully will) in the art of writing programs, or **thinking** about them