CSE581
Computer Science Fundamentals: Theory

Professor Anita Wasilewska

LECTURE 0

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

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 additional Special Lectures

We also present an OVERVIEW of parts of Chapters 2, 3, 4.

We discuss **Regular** and **Context Free** Languages,

and their relationship with **Finite** and **Pushdown** Automata, respectively.

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 **Book B1**

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.

Extra Credit There will be 2 One Page **Quizzes**

each 10pts, given in class for extra credit

You can earn up to **20pts** extra credits for the course.

Tests Preliminary Schedule

MIDTERM 1 Tuesday, October 7

Fall Break October 13 - 14

MIDTERM 2 Tuesday, November 11

Thanksgiving Break November 26 - 30

Last Day of classes December 8

FINAL Final Period December 10 - 18, exact date t.b.a

Extra Credit Quizzes

Quizzes are given during last 25 minutes of class on

September 23 and November 25

Remark: Pay attention to Extra Credit Quizzes schedule - there is **no makeups**

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 **0pts** 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

Midterm 1 - 100pts

Midterm 2 - 100pts

Final - 100pts

Extra Quizzes - 20pts **total**

None of grades will be curved

Final Grade Computation

You can earn up to

300 points + x extra points = 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%

Course PART 1

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 Languages and Extensional Semantics: Classical and Many Valued

Chapter 4: General Proof Systems: Syntax and Semantics

Chapter 5: Hilbert Proof Systems: **Completeness** of Classical Propositional Logic

Course PART 2

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 7 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 Thursday, October 2 to **prepare you** for the test

Course PART 2

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

Course PART 3

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***"*

Course PART 3

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