

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. Patashnik

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 4 - Number Theory**

VIDEO LECTURES

We have a **YOUTUBE** Channel

LOGIC, THEORY OF COMPUTATION

https://www.youtube.com/channel/UCLZp06JC9yit6M_YW3Xuvlw

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, Midterm 3 and **no 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

TESTS PRELIMINARY SCHEDULE

Changes, if any, will be posted on Brightspace and the course Webpage

EQ1 Thursday, September 24

MIDTERM 1 Thursday, October 8

Fall Break October 12 - 13

EQ2 Thursday, November 5

MIDTERM 2 Thursday, November 19

Thanksgiving Break November 25 - 29

MIDTERM 3 Thursday, December 3

Last Day of classes December 6

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 **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

Midterm 1 - 100pts

Midterm 2 - 100pts

Midterm 3 - 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 - only **SOME material** from the book **B1**

Approximately **3-4 weeks** of classes

Chapter 2 : Introduction to Classical **Propositional** and **Predicate** Logic. This is a chapter written for people without any logic knowledge.

Next we discuss **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 Theorem**

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 8** 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 1** 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, 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