



CS 311 / MA 352: Automata and Complexity Theory

Instructor's Name: Shahab Baqai

Year: 2006

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Quarter: Winter

Office Hours: Friday 1100 - 1300 hours

Category: Junior

TA for the Course: Malik Jahan Khan – jahan@lums.edu.pk

Course Code (Units) CS 311 / MA 352 (4 Units)

Course Description This is an introductory course on the theory of computation. Students are introduced to the concept of formal languages and automata. Formal languages cover regular grammar, regular expression, context free grammar and language. In automata they shall learn about finite automata (deterministic and non-deterministic) and pushdown automata. They shall also learn about fundamental concepts of Turing machines. Finally, if time permits, they shall be exposed to the basic questions of computability and tractability.

Core/Elective Elective

Pre-requisites CS 211 / MA 252, Discrete Mathematics

- Goals Provide mathematical maturity in the field of computer science. Develop skills of precise and formal reasoning in computer science.

Course Text John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Introduction to Automata Theory, Languages, and Computation, 2/E, Addison-Wesley 2001. ISBN 0-201-44124-1.

Reference Daniel I. A. Cohen, Introduction to Computer Theory 2/E, John Wiley & Sons, Inc 1997. ISBN 0-471-13772-3

URL Handouts. http://suraj.lums.edu.pk/~cs311w06

- Lectures, Tutorials & Attendance Policy There will be 19 sessions of 100 minutes each. When and if required. Attendance is mandatory and enforced indirectly by surprise quizzes and bonus points.

Grading Homework 05 ~ 10%, Quizzes 15 ~ 20%, Midterm 30 ~ 35%, Final Exam 40 ~ 45%. Variations will depend on factors such as number, average class performance and effectiveness of each instrument as perceived by the instructor.

- Grading Policy There will be absolutely no makeup quizzes. Makeup midterm & final exams will only be allowed in cases of extreme emergencies. Contact the PCO (as per policy) to apply for Makeup as soon as the emergency permits. For any credit all assignments must be turned in time. Request for review of awarded points or grade have to be made in writing and within three working days after grading of an instrument. Points awarded for partial credit are entirely at the discretion of the Instructor or TA.

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Module	Topics	Sessions	Readings
1	Introduction to Automata Review of proof techniques	1	1, 2.1
2	Finite Automata Deterministic/Non Deterministic Equivalence Epsilon NFA	2	2.2 – 2.5
3	Regular Expressions & Languages Regular expressions Regular Grammars Finite Automata and Regular Expressions	2.5	3.1 – 3.4
4	Properties of Regular Languages Algorithms for Regular Languages	2.5	4.1 – 4.4
5	Context-free Languages (CFL) Context-free grammars (CFG) Parse Trees Derivations and ambiguity	2	5.1 – 5.4
6	Midterm	1	
7	Push down automata (PDA) PDA/CFG Equivalence Deterministic PDA's	2	6.1 – 6.4
8	Properties of Context-free Languages Chomsky-normal-form grammars Pumping Lemma Closure Properties Algorithms for CFL's	2.5	7.1 – 7.4
9	Turing Machines Introduction Variations Acceptors/Transducers	2.5	8.1 – 8.5
10	Decidability Recursive & recursively enumerable languages Some real un-decidable problems	1	9.1 – 9.5
11	Intractable Problems P, NP Classes NP-complete problems	1	10.1 – 10.4