CSC-304: Theory of Automata

General Information

Course Number	CSC-304
Credit Hours	3 (Theory Credit Hour = 3, Lab Credit Hours = 0)
Prerequisite	
Facilitator	Muhammad Haris

Course Objectives

The course introduces some fundamental concepts in automata theory and formal languages including grammar, finite automaton, regular expression, formal language, pushdown automaton, and Turing machine. Not only do they form basic models of computation, they are also the foundation of many branches of computer science, e.g. compilers, software engineering, concurrent systems, etc. The properties of these models will be studied and various rigorous techniques for analyzing and comparing them will be discussed, by using both formalism and examples.

Catalog Description

CSC-304

Course Content

Week	Topics	Assignments/ Activity	Suggested Readings
Week 01	Mathematical preliminaries 1. Introduction to the course 2. Application areas 3. Sets Concepts and Notation 4. Relations	Cognitive Approach: - Define basic concepts - Giving different examples	handout and slides would be given by the instructor [Sipser] Chapter 1 [Ullman] Chapter 1
Week 02	**Language definitions preliminaries** 1. Definitions of language 2. Alphabet, Strings and words 3. Operations on strings 4. * Operation and + operation 5. Operations on languages	Cognitive and Affective Approach: -Define basic concepts - Q & A Session - Discussion and Giving Different examples	handout and slides would be given by the instructor [Sipser] Chapter 2 [Ullman] Chapter 1
Week 03	Recursive Thinking and Regular Expressions 1. Recursive definitions 2. Regular expression definition 3. Writing RE for a given language 4. Writing language from given RE	Cognitive , Affective and psychomotor Approach: -Define basic concepts - Q & A Session - Assignment - Quiz	handout and slides would be given by the instructor [Sipser] Chapter 3,4 [Ullman] Chapter 3

Week 04	**Finite Automata** 1. Protocol/Formalism of FA 2. Definition of Finite Automata	- Class Exercise and Discussion.	handout and slides would be given by the instructor [Sipser]
	3. Rules for designing automata 4. DFA and its languages		Chapter 5 [Ullman] Chapter 2
Week 05	**Transitions Graphs** 1. Relaxing the restriction on inputs 2. Looking at TGs 3. Generalized TGs 4. Non determinism		[Sipser] Chapter 6 [Ullman] Chapter 2
Week 06	**NFA and Kleene's Theorem** 1. Turning TGs into RE 2. Converting RE into FA 3. Conversion between DFA and NFA 4. Kleene's Theorem	Assignments	[Sipser] Chapter 7
Week 07	**Mid Term-I Examination**		
Week 08	**Regular Languages** 1. Closure Properties 2. Operations	Quiz	[Sipser] Chapter 10*
Week 09	**Pumping Lemma and Non regular Languages** 1. Pumping Lemma 2. Proving non RL		[Sipser] Chapter 10*
Week 10	**Context Free Grammars** 1. Syntax as method of defining languages 2. Symbolism for generative language 3. Trees 4. Ambiguity	Quiz	[Sipser] Chapter 12*
Week 11	**Grammatical Format** 1. Regular Grammars 2. Simplification 3. CNF		[Sipser] Chapter 13*
Week 12	**Push Down Automata** 1. A new format for FAs 2. Adding a Pushdown Stack 3. Defining PDAs	Quiz	[Sipser] Chapter 14*
Week 13	**Push Down Automata** CFG NFA Conversion between CFG and NPDA		[Sipser] Chapter 14*
Week 14	**Mid Term-II Examination**		
Week 15	**Context Free languages** 1. Closure Properties 2. Mixing CFG and regular languages	Assignment / Project	[Sipser] Chapter 17*

Week 16	**Turing machines** 1. The Turing Machine 2. Design different TM		Sipser] Chapter 19*
Week 17	**Terminal Examinations**		

Text Book

1. Introduction to the Theory of Computation By Michel Sipser , 3rd Edition

Reference Material

1. Introduction to Theory of computation, 3rd Edition , by Michel Siper
2. Introduction to Automata Theory Language and Computation, by John E. Hopcroft ,…., Ullman
3. Daniel I. A. Cohen, Introduction to Computer Theory 2/E, John Wiley & Sons, Inc 1997. ISBN 0-471-13772-3

Course Learning Outcomes

At the completion of the course, students will be able to…

1	Understanding basic concepts of Theory of Automata
2	Apply the pumping lemma to prove the languages
3	Convert from one model to another (RE, FA, Grammar, PDA)
4	Evaluate the Power of Machines/automata

CLO-SO Map

CLO ID	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12
CLO 1	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
CLO 2	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
CLO 3	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
CLO 4	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Approvals

Prepared By	Muhammad Haris
Approved By	Not Specified
Last Update	04/10/2021