

University of Engineering and Technology Lahore - New Campus (Kala Shah Kaku)

Section Course Outline Report

Department: Computer Science (KSK)

Printed Date: January 29, 2024

Section Course Detail	
Semester	SPRING 2024
Department	Computer Science (KSK)
Section	A
Subject Title	CS-273 Theory of Automata
Subject Domain	Non-Engineering
Subject Knowledge	Humanities
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Measureable Student Learning Outcomes					
CLOs	Description	PLOs	Domain	Domain Level	Assessments
CLO1	Define concepts in automata theory and theory of computation	PLO01	Cognitive	1. Remember	null
CLO2	Identify different formal language classes and their relationships	PLO01	Cognitive	2. Understand	null
CLO3	Design grammars and recognizers for different formal languages	PLO01	Cognitive	6. Create	null
CLO4	Prove or disprove theorems in automata theory using its properties	PLO01	Cognitive	4. Analyze	null
CLO5	Determine the decidability and intractability of computational problems	PLO01	Cognitive	4. Analyze	null
Class Timings					

Section Content		
Week (Lec)	Topics	CLO's

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Week (Lec)	Topics	CLO's
week1	Introduction to Course, Evolution of languages, Difference between Formal and Natural languages, Alphabets, Strings, Words, Valid and invalid alphabet, Length of a String, Reverse of a String, Introduction to defining languages: Recursive definition of a language, Regular expression, Kleene Closure, Union and Concatenation, Boolean Algebra and Binary Logic with arithmetic operations	CLO1
week2	Regular Languages: Formal definition of defining regular expressions, Languages associated with regular expressions, Relationship between regular expressions, regular languages, finite languages are regular, Introduction to Finite Automata: States, Transition, Acceptance or Rejection of a string, Representation of an FA by Transition Table	CLO2
week3	Pictorial representation of Finite Automata: Designing Finite Automata for regular languages, Construct FA, accept those string having a double letter in them, Demonstration Of JFLAP: Software for the simulation of Mathematical Models (Abstract Machines), Construct FA, accept all words with different first and last letter, Construct FA, accept language of even letters (EVEN-EVEN), Reducing number of states in FA: Deterministic and Non-Deterministic Finite Automata, NFA- ϵ (NFA with Null strings)	CLO3
week4	Transition Graph: Definition of Generalized Transition Graph, Relaxing the Restriction on Inputs, Convert TG's into Regular Expressions, Transition Graph: Converting an NFA/NFA- ϵ to DFA, Kleene's Theorem: Kleene's Theorem (I), Proof I: Define Finite Automaton for every Transition Graph	CLO3
week5	Kleene's Theorem: Kleene's Theorem (II), Proof II: Define Regular Expression for every transition graph, Kleene's Theorem (III), Proof 2: Converting every regular expression into Finite Automata, Kleene's Theorem: Nondeterminism by Kleene's Theorem (FA = NFA)	CLO4
week6	Moore and Mealy Machines: Example of Moore and Mealy Machine, Theorem of Moore and Mealy Machine, Regular Languages: Closure properties of Regular Languages, The Myhill- Nerode Theorem	CLO3
week7	Non-regular Languages: Pumping Lemma for regular languages, Pumping Lemma length, Pumping Lemma	CLO4
week8	Decidability, Decide whether or not a given FA accept any word, Decide whether two FA are equivalent, decide whether two regular expressions are equivalent, Demonstration Of JFLAP: Software for the simulation of Mathematical Models (Abstract Machines). Decidable Problems of Regular Languages: membership, finiteness, emptiness, equivalence	CLO5
week9	Introduction to Grammars: Defining different Classes of Grammars, Regular Grammar, Context Free Grammar, CFG for different languages and understanding languages defined by CFG, Derivation: Left Most and Right Most Derivation, Parse Trees, Ambiguous grammars, Total language tree	CLO3

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week10	Simplification of Context-Free Grammar: Killing Productions, Killing Null Productions, Removing Unit Productions, Removing Useless Productions, Conversion to Chomsky Normal Form, Conversion to Greinbach Normal Form	CLO3
week11	PDA and Context Free Languages, Deterministic and Non deterministic PDA, Designing PDA for different language	CLO2
week12	CFG = PDA: Building CFG for every PDA, Building PDA for every CFG, Convert CFG to CNF (Chomsky Normal Form) Non-Context-free Languages: Pumping Lemma for CFL, Context-free Languages: Closure properties of Context Free Languages, Decidability: Emptiness and Uselessness Finiteness of CFL	CLO3
week13	Decidability: Emptiness and Uselessness Finiteness of CFL, Conversion to Greinbach Normal Form unit Production Properties of Context-Free Language: CFL is closed under the operation of Union, CFL is closed under the operation of Concatenation, CFL is closed under the operation of Kleene Closure, CFL is NOT closed under the operation of Intersection, CFL is NOT closed under the operation of Complement, The intersection of regular and context-free language is also context free, Theorem proof practice for pushdown automata and context free language	CLO5
week14	Mealy and Moore Machine , Mealy to moore machine conversion, Moore to Mealy machine Conversion, Turing Machine, Turing Machine Construction, Turing Machine examples, Revision	CLO3