

Addis Ababa Science and Technology University						
1	College: Electrical and Mechanical Engineering			Department: Software Engineering		
2	Course Name	Formal Language and Automata Theory				
	Course Code:	SWEG4101				
3	Synopsis:	Formal languages and automata theory is based on mathematical computations. These computations are used to represent various mathematical models. Automata theory is a theory of models. Working of every process can be represented by means of models. The model can be theoretical or mathematical model. The model helps in representing the concept of every activity. In this Basics of all fundamental concepts of automata theory and those are strings, languages, operations on the languages will be discussed. Formal languages including grammar, finite automaton, regular expression, pushdown automaton, Context-free Grammar, Context-free Languages, Backus-Naur, Chomsky Normal Form and Turing machine also will be discussed. 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, and concurrent systems.				
4	Name(s) of Academic Staff:	Befkadu Belete				
5	Semester and Year offered:	Semester:	I	Year:	4	
6	Credit Hour:	3				
7	Prerequisite/ Co-requisite: (if any)	Discreet Mathematics, Data Structure and Algorithms				
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:					
	CLO1	Acquire a fundamental understanding of the core concepts in automata theory and formal languages				
	CLO2	An ability to design grammars and automata (recognizers) for different language classes. And an ability to identify formal language classes and prove language membership properties				
	CLO3	An ability to prove and disprove theorems establishing key properties of formal languages and automata				

	CLO4	Acquire a fundamental understanding of core concepts relating to the theory of computation and computational models including (but not limited to) decidability and intractability.																					
9	Mapping of the course Learning Outcomes to the program Learning Outcomes, Teaching Methods and Assessment:																						
	Course Learning Outcomes (CLO)	Program Learning Outcomes (PO)												Teaching Methods				Assessment					
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12					Test	Quiz	Assignment	Project	Lab-report	
														L	T	P	O						
		CLO1	√												√				√				
	CLO2		√											√				√	√	√			
	CLO3					√								√				√		√			
	CLO4												√	√				√	√	√			
Indicate the relevancy between the CLO and PO by ticking “√” on the appropriate relevant box																							
10	Transferable Skills (if applicable) (Skills learned in the course of study which can be useful and utilized in other settings)																						
	1																						
	2																						
	3																						
11	Distribution of Student Learning Time (SLT)																						
	Course Content Outline							CLO	Teaching and Learning Activities											Total (SLT)			
									Guided learning (F2F)				Guided Learning (NF2F)		Independent Learning (NF2F)								
L				T		P			O														

	Chapter 1: Mathematical Preliminaries and Notation								
	1.1 Set	1	2				1	1	4
	1.2 Function and Relations	1	2					1	3
	1.3 Graphs and Trees	1	2				1	2	5
	1.4 Proof Techniques								
	1.5 Basic Concepts	1	2						2
	Chapter 2: Finite Automata								
	2.1 Deterministic Finite Automata (DFA)	2	2					2	4
	2.2 Non-deterministic Finite Automata (NFA)	2	2					1	3
	2.3 Equivalence of NFA and DFA	3	2					1	3
	2.4 Conversion NFA-DFA	3	2				1	1	4
	2.5 Reduction of the Number of States of Finite Automata	3	2				1	1	4
	Chapter 3: Regular Expressions, Regular Languages and Regular Grammars								
	3.1 Formal Definition of a Regular Expression	3	2				1	1	4
	3.2 Languages Associated with Regular Expressions	3	2				1	1	4
	3.3 Regular Expressions to Finite Automata,	3	2				1	1	4
	3.4 Finite Automata to RE								
	3.5 Applications of REs	3	2				2	1	5
	3.6 Right- and Left-Linear Grammars	3	1						

	3.7 Right-Linear Grammars Generate Regular Languages	3	1				1	1	3
	3.8 Right-Linear Grammars for Regular Languages	3	2				2	1	5
	Chapter 4: Context free languages								
	4.1 Context free languages	3	2				1	1	4
	4.2 Parsing and ambiguity	3	1				2	1	4
	4.3 Sentential forms	3	1				1		2
	4.4 Leftmost and right most derivation	3	1						1
	4.5 Derivation tree or Parse tree	3	2					1	3
	4.6 Definition, Relationship between parse trees and derivations.	3	1				1	1	3
	4.7 Context-Free Grammars and Programming Language	3	1				2	1	4
	Chapter 5: Simplification of context free grammar								
	5.1 Methods for Transforming Grammars	3	2					1	3
	5.2 Chomsky's hierarchy of grammars	3	2				1	1	4
	5.3 Two Important Normal Forms	4	1						1
	5.4 Chomsky Normal Form	4	2					1	3
	5.5 Greibach Normal Form								
	Chapter 6: Pushdown automata								
	6.1 Non deterministic Pushdown Automata	4	1					1	2
	6.2 Pushdown Automata for Context Free Languages	4	2					1	3

	6.3 Context-Free Languages for Pushdown Automata for			4	2						2
	Chapter 7: Turing Machine										
	7.1 The standard Turing machine			4	1				1	2	
	7.2 Turing machine as machine accepters			4	2				1	3	
	7.3 Turing machine as Transducers			4	2					2	
	7.4 Universal Turing Machines			4	2			1	1	4	
	Total									108 hours	
	Assessment										
	Continuous Assessment		Percentage Total-50(%)		F2F		NF2F		SLT		
	1	Tests		20%		√				2hour	
	2	Quize		10%		√				1hour	
	3	Assignments		10%				√		3hour	
	4	Assignments		10%		√		√		3hour	
	5	Others									
	Total									9hours	
Final Exam		Percentage 50 (%)		F2F		NF2F		SLT			
Final Exam		50%		√				3hrs			
Grand Total SLT									120hours		
	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non Face to Face Note: indicates the CLO based on the CLO's numbering in item 9.										
12	Special requirements and resources to deliver the course		1	Choose an item.							
			2	Choose an item.							
			3	Choose an item.							

	(e.g. software, computer lab, simulation room ...etc.)	4	Choose an item.
		5	Choose an item.
13	Text book and reference:	1	Text book : An Introduction to FORMAL LANGUAGES and AUTOMATA 5 th Edition by PETER LINZ University of California at Davis
		2	Reference: THEORY OF COMPUTER SCIENCE Automata, Languages and Computation 5 th Edition by K.I.P. MISHRA and N. CHANDRASEKARAN
		3	
		4	
		5	