Course Code	18CSC301T	Course Name	FORMAL LANGUAGE AND AUTOMATA	Course Category	C	Professional Core	L	T	P	C
							3	0	0	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Science and Engineering	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR): *The purpose of learning this course is to:*

		Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	Utilize the mathematics and engineering principles for the basics of Formal Language			
CLR-2 :	Acquire knowledge of Automata and minimize with Regular language's			
CLR-3 :	Acquire knowledge of Context free Grammar and simplify using normal forms			
CLR-4 :	Gain knowledge to push down automata and apply it with CFL			
CLR-5 :	Analyze the methods of turning machine			
CLR-6 :	Analyze and Design the methods of computational complexity			

Course Learning Outcomes (CLO): *At the end of this course, learners will be able to:*

		Program Learning Outcomes (PLO)														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Acquire the knowledge of mathematics and engineering principles for the basics of Formal Language	M	H	-	H	L	-	-	-	L	L	-	H	-	-	-
CLO-2 :	Acquire the ability to identify specification of a Regular language's with Automata	M	H	L	M	L	-	-	-	M	L	-	H	-	-	-
CLO-3 :	Acquire knowledge of Context free Grammar and simplify using normal forms	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-4 :	Understand the concepts of push down automata and CFL .	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-5 :	Apply the knowledge to turning machine and its methods	H	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-6 :	Design the computational and acceptor machines using FA, PDA and Turing machines	L	H	-	H	L	-	-	-	L	L	-	H	-	-	-

Duration (hour)		11	9	9	9	7
S-1	SLO-1	Introduction to Automaton	Grammars: Introduction: Types of Grammar	Pushdown Automata: Definitions Moves	Turing Machines: Introduction	Undecidability :Basic definitions
	SLO-2	Mathematical concepts	Context Free Grammars and Languages	Instantaneous descriptions	Formal definition of Turing machines, Instantaneous descriptions	Decidable problems,
S-2	SLO-1	Formal Languages: Strings, Languages, Properties	Derivations	Deterministic pushdown automata	Turing Machine as Acceptors	Examples of undecidable problems and Problems
	SLO-2	Finite Representation : Regular Expressions	Ambiguity	Problems related to DPDA	Problems related to turning machine as Acceptors	Rice's Theorem
S-3	SLO-1	Problems related to regular expressions	Relationship between derivation and derivation trees	Non - Deterministic pushdown automata	Problems related to turning machine as Acceptors	Undecidable problems about Turing Machine- Post's Correspondence Problem
	SLO-2	Finite Automata :Deterministic Finite Automata	Problems related to Context free Grammar	Problems related to NDPDA		Problems related to Post's Correspondence Problem
S-4	SLO-1	Nondeterministic Finite Automata	Simplification of CFG : Elimination of Useless Symbols	Problems related to DPDA and NDPDA	Turing Machine as a Computing Device	Properties of Recursive and Recursively enumerable languages
	SLO-2	Finite Automaton with €- moves			Problems related to turning Turing Machine as a Computing Device	
S-5	SLO-1	Problems related to Deterministic and Nondeterministic Finite Automata	Simplification of CFG : Unit productions	Pushdown automata to CFL Equivalence	Problems related to turning Turing Machine as a Computing Device	Introduction to Computational Complexity: Definitions
	SLO-2	Problems related to Finite Automaton with €- moves	Simplification of CFG : Null productions	Problems related to Equivalence of PDA to CFG		Time and Space complexity of TMs
S-6	SLO-1	Equivalence of NFA and DFA	Problems related to Simplification of CFG	Problems related to Equivalence of PDA to CFG	Techniques for Turing Machine Construction	Complexity classes: Class P, Class NP
	SLO-2	Heuristics to Convert NFA to DFA				
S-7	SLO-1	Equivalence of NDFA's with and without €-moves	Chomsky normal form	CFL to Pushdown automata Equivalence	Considering the state as a tuple Considering the tape symbol as a tuple	Complexity classes: Introduction to NP-Hardness
	SLO-2	Problems related Equivalence of NDFA's with and without €-moves	Problems related to CNF	Problems related to Equivalence of CFG to PDA	Checking off symbols	NP Completeness
S-8	SLO-1	Minimization of DFA	Greiback Normal form	Pumping lemma for CFL	Modifications of Turing Machine	
	SLO-2	Problems related to Minimization of DFA			Multi-tape Turing Machine	

S-9	SLO-1	*Regular Languages : Equivalence of Finite Automata and Regular Languages*	*Problems related to GNF*	*Problems based on pumping Lemma*	*Non-Deterministic Turing Machine*	
	SLO-2	*Equivalence of Finite Automata and Regular Grammars*			*Semi-Infinite Tape Turing Machine*	
S-10	SLO-1	*Problems related to Equivalence of Finite Automata and Regular Languages and Regular Grammars*				
	SLO-2	*Variants of Finite Automata :Two-way Finite Automaton Mealy Machines*				
S-11	SLO-1	*Properties of Regular Languages: Closure Properties*				
	SLO-2	*Set Theoretic Properties & Other Properties*				
	SLO-3	*Pumping Lemma*				

Learning Resources	1.Hopcroft J.E., Motwani R. and Ullman J.D, "Introduction to Automata Theory, Languages and Computations", Second Edition, Pearson Education, 2008. 2. Michael Sipser, "Introduction to the Theory of Computation" Cengage Learning, 2012.	*4*..John.C.Martin, "Introduction to Languages and the Theory of Computation" McGraw-Hill Education, 01- May-2010. 5. Kamala Krithivasan, Rama.R," Introduction to Formal Languages, Automata Theory and Computation", Pearson Education India, 01-Sep-2009. 6. Peter Linz , "An introduction to formal languages and automata", Jones & Bartlett Learning, 2001.

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember Understand	*40 %*	-	*30 %*	-	*30 %*	-	*30 %*	-	*30%*	-
Level 2	Apply Analyze	*40 %*	-	*40 %*	-	*40 %*	-	*40 %*	-	*40%*	-
Level 3	Evaluate Create	*20 %*	-	*30 %*	-	*30 %*	-	*30 %*	-	*30%*	-
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
		Dr.R.AnnieUthra
		Dr.Jeyasudha