Course Code	21CSC301T	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	School of Computing		Data Book / Codes / Standards	Nil	

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

CLR-1: construct automata for any equivalent regular expressions
CLR-2: acquire brief knowledge about automata languages
CLR-3: analyze about context free grammars and its implementation in Push down automata
CLR-4: interpret the power of Turing machine and the decidable nature of a problem
CLR-5: categorize undecidable problems and NP class problems

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

CO-1: summarize the basic concepts of deterministic and non-deterministic finite automata and its applications
CO-2: analyze the formal relationships among machines, languages and Context free grammars and its normalization
CO-3: construct the Push down stack machine and its context free language acceptance and its equivalence with CFG
CO-4: analyze the techniques for Turing machine construction and its recursive languages and functions
CO-5: evaluate the computational complexity of various problems

CO	Program Outcomes (PO)												Program Specific Outcomes		
	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern Tool Usage	The engineer and society	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO-1	PSO-2	PSO-3
	1	2	3	4	5	6	7	8	9	10	11	12			
CO-1	-	1	1	-	-	-	-	-	-	-	-	-	1	3	-
CO-2	-	3	3	-	-	-	-	-	-	-	-	-	1	3	-
CO-3	-	2	2	-	-	-	-	-	-	-	-	-	1	3	-
CO-4	-	2	2	-	-	-	-	-	-	-	-	-	1	3	-
CO-5	-	3	3	-	-	-	-	-	-	-	-	-	1	3	-

Unit-1 - Finite Automata and Regular Expressions — **9 Hour**
Deterministic and Non-Deterministic Finite Automata, Finite Automata with ε-moves, regular expressions – equivalence of NFA and DFA, two-way finite automata, Moore and Mealy machines, Equivalence of Moore and Mealy machines, applications of finite automata.

Unit-2 - Regular Sets and Context Free Grammars — **9 Hour**
Properties of regular sets, context-Free Grammars, and Languages – derivation trees, Simplification of CFG: Elimination of Useless Symbols Simplification of CFG: Unit productions, Null productions - Chomsky Normal Forms and Greibach Normal Forms, ambiguous and unambiguous grammars; minimization of finite automata

Unit-3 - Pushdown Automata and Parsing Algorithms — **9 Hour**
Deterministic Push Down Automata – Non-Deterministic Push Down Automata – Equivalence of Pushdown Automata and context-free languages; Properties of CFL; Applications of pumping lemma – closure properties of CFL and decision algorithms; Overview of Top-down parsing and Bottom-up parsing

Unit-4 - Turing Machines — **9 Hour**
Turing machines (TM) – computable languages and functions – tuning machine constructions – storage in finite control – variations of TMs – Church-Turing thesis – Universal Turing machine– recursive and recursively enumerable languages

Unit-5 - Introduction to Computational Complexity — **9 Hour**
Time and Space complexity of TMs – complexity classes – introduction to NP-Hardness and NP-Completeness Post Correspondence Problems (PCP) – Modified PCP – Halting Problems – Undecidability Problems

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	3. John.C. Martin, "Introduction to Languages and the Theory of Computation" McGraw-Hill Education, 01-May-2010. 4. Peter Linz, "An introduction to formal languages and automata",Jones & Bartlett Learning, 6th ed 2017

Learning Assessment

Bloom's Level of Thinking		Continuous Learning Assessment (CLA)				Summative Final Examination (40% weightage)	
		Formative CLA-1 Average of unit test (50%)		Life-Long Learning CLA-2 (10%)			
		Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	15%	-	15%	-	15%	-
Level 2	Understand	25%	-	20%	-	25%	-
Level 3	Apply	30%	-	25%	-	30%	-
Level 4	Analyze	30%	-	25%	-	30%	-
Level 5	Evaluate	-	-	10%	-	-	-
Level 6	Create	-	-	5%	-	-	-
	Total	100 %		100 %		100 %	

Course Designers

Experts from Industry
1. Santhosh Muniswami, Cisco Systems, Inc.
2. B. Divya, TCS

Experts from Higher Technical Institutions
1. Dr. P. Victer Paul, Indian Institute of Information Technology Kottayam
2. Dr.C. Punitha Devi, Pondicherry University,

Internal Experts
1. Dr. N. Arunachalam,SRMIST
2. Dr. K. Vijaya,SRMIST