Formal Languages and Automata Theory

Course Code	20BS1403	Year	II	Semester	II
Course Category	BS	Branch	CSE	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	Discrete Mathematical Structures
Continuous Internal Evaluation :	30	Semester End Evaluation:	70	Total Marks:	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Understand the fundamental concepts of Formal Languages and Automata.	L2
CO2	Apply the knowledge of Automata Theory, Grammars & Regular Expressions for solving various problems.	L3
CO3	Apply different Turing machines techniques to solve problems.	L3
CO4	Analyze automata and their computational power to recognize languages.	L4

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:Substantial, 2: Moderate, 1:Slight)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2	3									1				
CO3													2	
CO4		3							1	1		1		

Syllabus		
Unit No.	Contents	Mapped CO
I	**Automata:** Why study Automata Theory?, The central Concepts of Automata Theory. **Finite Automata:** Deterministic Finite Automata, Non-Deterministic Finite Automata, Finite Automata with Epsilon Transitions, Finite Automata with Outputs(without conversions)	CO1, CO2, CO4

II	**Regular Expressions and Languages**: Regular Expressions, Finite Automata and Regular Expressions, Algebraic Laws for Regular expressions (without proofs). **Properties of regular Languages:** Proving Languages not to be regular, Closure properties of Regular Languages (without proofs), Equivalence and Minimization of Automata.	**CO1, CO2**
III	**Context–free grammars and Languages**: Context–free grammars, Parse trees, Ambiguity in grammars and Languages, **Properties of Context-free languages:** Normal Forms for Context Free Grammars, The Pumping Lemma For Context Free Languages	**CO1, CO2**
IV	**Pushdown Automata:** Definition of the Pushdown Automaton, The Languages of a PDA, Equivalence of PDA's and CFG's, Deterministic Pushdown Automaton.	**CO1, CO2, CO4**
V	**Turing Machines:** Problems that computer cannot solve, The Turing Machine, Programming Techniques for Turing Machine, Extensions to the Basic Turing Machine **Undecidability:** Recursively Enumerable Language, Universal Turing Machines (UTM), Halting Problem, Post Correspondence Problem, Church Hypothesis.	**CO1,CO2, CO3, CO4**

Learning Resources

Text Books

1. Introduction to Automata Theory, Languages and Computations, J.E.Hopcroft, R.Motwani and J.D Ullman, Third Edition, Pearson Education.
2. Theory of Computer Science, Automata languages and computation, Mishra, Chandra Shekaran, Second Edition, PHI.

Reference Books

1. Introduction of the Theory and Computation, Michael Sipser, 1997, Thomson Brokecole.
2. Elements of The theory of Computation, H.R.Lewis and C.H.Papadimitriou, Second Edition, 2003, Pearson Education/PHI.
3. Formal Languages and Automata Theory, Basavarj S. Anami, Karibasappa K.G, WILEYINDIA.
4. Introduction to Languages and the Theory of Computation, J.C.Martin, Third Edition, TMH, 2003.

e- Resources & other digital material

1. https://www.udemy.com/course/formal-languages-and-automata-theory-e/
2. https://eecs.wsu.edu/~ananth/CptS317/
3. https://nptel.ac.in/courses/106/103/106103070/
4. https://nptel.ac.in/courses/106/106/106106049/
5. https://nptel.ac.in/courses/111/103/111103016/
6. https://nptel.ac.in/courses/106/105/106105196/