

**PRASAD V. POTLURI SIDDHARTHA INSTITUTE OF TECHNOLOGY  
KANURU, VIJAYAWADA**

**Department of Computer Science and Engineering**

**FORMAL LANGUAGES AND AUTOMATA THEORY**

<b>Course Code</b>	<b>23CS3503</b>	<b>Year</b>	III	<b>Semester</b>	I
<b>Course Category</b>	Professional Core	<b>Branch</b>	CSE	<b>Course Type</b>	PC
<b>Credits</b>	3	<b>L – T – P</b>	3-0-0	<b>Prerequisites</b>	Discrete Mathematical Structures
<b>Continuous Evaluation</b>	30	<b>Semester End Evaluation</b>	70	<b>Total Marks</b>	100

<b>Course Outcomes</b>		
Upon successful completion of the course, the student will be able to:		
<b>CO1</b>	Apply concepts of formal languages and automata to solve computational problems.	L3
<b>CO2</b>	Apply finite automata, regular expressions, context-free grammars, and pushdown automata for the design of language recognizers.	L3
<b>CO3</b>	Apply Turing machine techniques to solve problems.	L3
<b>CO4</b>	Analyze automata and their computational power to recognize languages.	L4

<b>Syllabus</b>		
<b>Unit No.</b>	<b>CONTENTS</b>	<b>Mapped CO</b>
<b>I</b>	<b>Automata:</b> Why study Automata Theory?, The central Concepts of Automata Theory. <b>Finite Automata:</b> Deterministic Finite Automata, Non-Deterministic Finite Automata, Finite Automata with Epsilon Transitions, Finite Automata with Outputs(without conversions)	CO1, CO2
<b>II</b>	<b>Regular Expressions and Languages:</b> Regular Expressions, Finite Automata and Regular Expressions, Algebraic Laws for Regular expressions (without proofs). <b>Properties of regular Languages:</b> Proving Languages not to be regular, Closure properties of Regular Languages (without proofs), Equivalence and Minimization of Automata.	CO1, CO2, CO4
	<b>Context-free grammars and Languages:</b> Context-free grammars, Parse trees,	CO1,

<b>III</b>	Ambiguity in grammars and Languages, <b>Properties of Context-free languages:</b> Normal Forms for Context Free Grammars, The Pumping Lemma For Context Free Languages	CO2,CO4
<b>IV</b>	<b>Pushdown Automata:</b> Definition of the Pushdown Automaton, The Languages of a PDA, Equivalence of PDA's and CFG's, Deterministic Pushdown Automaton.	CO1,CO2
<b>V</b>	<b>Turing Machines:</b> Problems that computer cannot solve, The Turing Machine, Programming Techniques for Turing Machine, Extensions to the Basic Turing Machine <b>Undecidability:</b> Recursively Enumerable Language, Universal Turing Machines (UTM), Halting Problem, Post Correspondence Problem, Church Hypothesis.	CO1,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/>