Formal Languages and Automata Theory

Course Code	19CS3502	**Year**	III	**Semester**	I
Course Category	Program Core	**Branch**	CSE	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Discrete Mathematics
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	Analyze automata and their computational power to recognize languages.	**L4**
CO4	Analyze different Turing machines techniques to solve problems	**L4**

Syllabus		
Unit No.	**Contents**	**Mapped CO**
I	**Fundamentals:** Strings, Alphabet, Language, Operations, Chomsky hierarchy of languages **Finite Automata:** Definitions, finite automation model, Deterministic Finite Automata, Non-Deterministic Finite Automata, Finite Automata with Epsilon Transitions, and Finite Automata with Output.	**CO1,CO3**
II	**Regular Expressions and Languages**: Regular Expressions, identity Rules, Finite Automata and Regular Expressions, Applications of Regular Expressions, Closure Properties of Regular Sets, Pumping Lemma for Regular Languages, Equivalence and Minimization of Finite Automata .	**CO1,CO2**
III	**Grammars:** Context–free grammars; Parse trees; Applications; Ambiguity in grammars and Languages, Simplification of Context Free Grammars, Normal Forms, Pumping Lemma For Context Free Languages	**CO1,CO2**

IV	**Pushdown Automata:** Definition of the Pushdown Automaton, The Language of Push Down Automaton, Equivalence between Acceptance by Empty Store and Acceptance by Final State, Equivalence of CFG and PDA, Deterministic Pushdown Automaton, Closure Properties of Context Free Languages.	**CO1,CO2, CO3**
V	**Turing Machines:** Turing Machine as Acceptor, Turing Machine as a Computing Device, Programming Techniques for Turing Machine, Extensions to the Basic Turing Machine, Universal Turing Machines (UTM), Halting Problem, Post Correspondence Problem	**CO1,CO3, CO4**

Learning Resources

Text Books

1. Introduction to Automata Theory, Languages and Computations,H.E.Hopcroft, R.Motwani and J.D Ullman, Second Edition, Pearson Education.
2. Introduction of the Theory and Computation, Michael Sipser, 1997, Thomson Brokecole.

References

1. Theory of Computer Science, Automata languages and computation, Mishra,Chandra Shekaran, Second edition, PHI
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, WILEY-INDIA.
4. Introduction to Languages and the Theory of Computation,J.C.Martin, Third Edition, TMH, 2003.