

<b>CB214</b>	<b>FORMAL LANGUAGES AND AUTOMATA THEORY</b>	<b>L T P C Int Ext</b>
		<b>2 1 - 3.0 30 70</b>

**Semester III [Second Year]**

**COURSE OBJECTIVES:**

**The main objectives of this course are to:**

1. Introduce the types of Finite Automata and properties of Regular Expressions.
2. Explain Context-Free Grammars and Push Down Automata
3. Introduce the Turing Machine and explain undesirability concept.

**COURSE OUTCOMES:**

**After successful completion of the course, the students are able to**

1. Explain the fundamental concepts of Automata and Formal languages. L2
2. Apply the knowledge of Automata Theory, Formal languages, Grammars & Regular Expressions for solving various problems. L3
3. Design PDAs for various languages.L4
4. Design Turing machines to solve problems.L4

**UNIT I**

[CO:1,2] (12)

**Automata:** Introduction to Automata, The central concepts of automata theory Alphabets, Strings, Languages.

**Finite Automata:** An Informal picture of finite automata, Deterministic finite automata(DFA)-Definition of DFA, DFA processing strings, Notations for DFA, Extended transition function, the language of DFA, Nondeterministic finite automata(NFA) Definition of NFA, Extended transition function, the language of NFA, Equivalence of DFA and NFA Finite.

**Automata with  $\epsilon$  transitions:** Use of  $\epsilon$ -transition, notation for a  $\epsilon$ -NFA, Epsilon closures, extended transitions and languages, Applications.

**UNIT II**

[CO:1,2] (12)

**Regular Expressions and Languages:** Regular expressions, finite automata and regular expressions, Algebraic laws of regular expressions.

**Properties of Regular Languages:** Proving languages are not regular Pumping lemma for regular languages, Applications of the pumping lemma, Closure Properties of Regular Languages, Equivalence and minimization of automata Minimization of DFA.

**UNIT III**

[CO:1,2,3] (12)

**Context Free Grammars:** Context Free Grammars, Parse Trees, Constructing parse trees, derivations and parse trees, ambiguous grammars.

**Push down Automata:** Definition of the Pushdown automata, the languages of PDA, Equivalences of PDA and CFG.

**Context free languages:** Normal form for Context-Free grammars, the pumping lemma for context free languages.

**UNIT IV**

[CO:1,2,4] (12)

**Properties of Context free languages:** closure properties for context free languages, Decision properties for CFL.

**Introduction to Turing Machines:** The Turing Machine, programming techniques for Turing machines.

**Undecidability:** A language that is not recursively enumerable, an undecidable problem that is RE, Undecidability problems about TM, Post's Correspondence problem.

**LEARNING RESOURCES:**

**TEXT BOOK:**

John. E. Hopcroft, R. Motwani, & Jeffery. D. Ullman, "Introduction to Automata Theory, Languages and Computations", Second Edition, Pearson Education, 2003

**REFERENCE BOOK(S):**

1. Daniell. A. Cohen, "Computer Theory",
2. KLP Mishra & N. Chandrasekharan, "Theory of Computation", PHI.
3. Micheal Sipser, "Introduction of the Theory and Computation", Thomson Brokecole, 1997.

**WEB RESOURCES:**

Web Reference: [https://swayam.gov.in/nd1\\_noc19\\_cs79/preview](https://swayam.gov.in/nd1_noc19_cs79/preview)