THEORY OF COMPUTATION

IV Semester: CSE / CSE(AI&ML) / CSIT / IT: V Semester: CSE(CS) / CSE(DS)

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AITC04	Core	3	1	0	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

Prerequisites: Discrete Mathematical Structures

I. COURSE OVERVIEW:

This course focuses on infinite languages in finite ways, and classify machines by their power to recognize .It includes finite automata, regular grammar, push down automata ,context free grammars, and Turing machines It is applicable in designing phrasing and lexical analysis of a compiler, genetic programming and recursively enumerable languages.

II. OBJECTIVES:

The students will try to learn:

I. The fundamental knowledge of automata theory which is used to solve computational problems.
II. The reorganization of context free language for processing infinite information using push down automata.
III. The computer based algorithms with the help of an abstract machines to solve recursively enumerable problems.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:

CO 1	**By Knowing the basic concepts of** Alphabet, strings, language, operations to construct DFA, NFA and conversion of NFA to DFA, Moore and Melay Machines and interpret differences between them	Apply
CO 2	**Discuss** Regular sets, regular expressions, identity rules to construct finite automata for a given regular expressions and conversion of finiteautomata to regular expressions.	Understand
CO 3	**Apply** the pumping lemma on regular and context free languages.	Apply
CO 4	**Demonstarte** context free grammars, Chomsky and Greibach normal forms for generating patterns of strings and minimize the ambiguity inparsing the given strings.	Understand
CO 5	**Construct** push down automata for context free languages for developing parsing phase of a compiler.	Apply
CO 6	**Apply** Turing machines and Linear bounded automata for recognizing the languages for complex problems.	Apply

III. SYLLABUS:

MODULE –I: FINITE AUTOMATA

Fundamentals: Alphabet, strings, language, operations; Introduction to finite automata: The central concepts of automata theory, deterministic finite automata, nondeterministic finite automata, an application of finite automata, finite automata with and without epsilon transitions, Conversion of NFA to DFA, Moore and Melay Machines.

MODULE –II: REGULAR LANGUAGES

Regular sets, regular expressions, identity rules, constructing finite automata for a given regular expression, conversion of finite automata to regular expressions, pumping lemma of regular sets, closure properties of regular sets (proofs not required), regular grammars-right linear and left linear grammars, equivalence
between regular linear grammar and finite automata, inter conversion.

MODULE –III: CONTEXT FREE GRAMMARS

Context free grammars and languages: Context free grammar, derivation trees, sentential forms, right most and leftmost derivation of strings, applications.
Ambiguity in context free grammars, minimization of context free grammars, Chomsky normal form, Greibach normal form, pumping lemma for context free languages, enumeration of properties of context free language (proofs omitted).

MODULE –IV: PUSHDOWN AUTOMATA

Pushdown automata, definition, model, acceptance of context free language, acceptance by final state and acceptance by empty stack and its equivalence, equivalence of context free language and pushdown automata, inter conversion;(Proofs not required); Introduction to deterministic context free languages and
deterministic pushdown automata.

MODULE –V: TURING MACHINE

Turing machine: Turing machine, definition, model, design of Turing machine, computable functions, recursively enumerable languages, Church's hypothesis, counter machine, types of Turing machines (proofs not required), linear bounded automata and context sensitive language, Chomsky hierarchy of languages.

V.TEXT BOOKS:

1. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, "Introduction to Automata, Theory, Languages and Computation"|, Pearson Education, 3rd Edition, 2007.

VI. REFERENCE BOOKS:

1. John C Martin, –Introduction to Languages and Automata Theory|, Tata McGraw-Hill, 3rd Edition, 2017.
2. Daniel I.A. Cohen, –Introduction to Computer Theory|, John Wiley & Sons, 2nd Edition, 2004.

VII. WEB REFERENCES:

1. https://www.tutorialspoint.com/automata_theory/index.htm
2. https://www.iitg.ernet.in/dgoswami/Flat-Notes.pdf