THEORY OF COMPUTATION

IV Semester: CSE / IT

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AIT002	Foundation	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

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 machine to solve recursively enumerable problems.

COURSE LEARNING OUTCOMES:

After successful completion of this course, students will be able to:

CO 1 Recall the fundamental concepts of alphabet, strings and languages for representing grammars and automata.
CO 2 Make use of deterministic finite automata and non deterministic finite automata for modeling lexical analysis and text editors.
CO 3 Demonstrate regular sets and regular expressions for equivalent character combinations in strings.
CO 4 Apply the pumping lemma on regular and context free languages to perform negative test .
CO 5 Explain right linear and left linear grammars for parsing and designing programming languages.
CO 6 Recall the recursive rules of context free grammars for generating patterns of strings.
CO 7 Apply normalization techniques (Chomsky normal form, Greibach normal form) on context free grammars to minimize the ambiguity in parsing the given strings.
CO 8 Construct push down automata for context free languages to develop parsing phase of a compiler.
CO 9 Recall deterministic context free languages and pushdown automata for evaluating arithmetic expression, stack application.
CO 10 Define the concept of Turing machines for solving real time computations and complex functions like recursively enumerable problem.
CO 11 Make use of linear bounded automata for recognizing context sensitive languages and implementation of genetic programming.

UNIT-I	FINITE AUTOMATA	Classes: 9

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 epsilon transitions.

UNIT-II	REGULAR LANGUAGES	Classes: 9

Regular sets, regular expressions, identity rules, constructing finite automata for a given regular expressions, 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.

UNIT-III	CONTEXT FREE GRAMMARS	Classes: 10

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).

UNIT-IV	PUSHDOWN AUTOMATA	Classes: 8

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.

UNIT-V	TURING MACHINE	Classes: 9

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.

Text Books:

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

Reference Books:

1. John C Martin, "Introduction to Languages and Automata Theory", Tata McGraw-Hill, 3rd Edition, 2007.
2. Daniel I.A. Cohen, "Introduction to Computer Theory", John Wiley & Sons, 2nd Edition, 2004.

Web References:

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

E-Text Books:

https://freefundkenotes.files.wordpress.com/2014/02/toc-klp-mishra.pdf

MOOC Courses:

1. http://nptel.ac.in/courses/111103016/
2. http://nptel.ac.in/courses/106106049/
3. http://onlinevideolecture.com/?course_id=1312
4. http://www.nptelvideos.in/2012/11/theory-of-computation.html