THEORY OF COMPUTATION

IV Semester: CSE / IT

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AITB03	Core	3	1	-	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

I. COURSE OVERVIEW:

This course focuses on infinite languages in finite ways, and classifies 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 course should enable the students to:

I	The fundamental knowledge of automata theory which is used to solvecomputational 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

III. COURSE OUTCOMES:

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

CO 1	**Make use of** deterministic finite automata and non deterministic finite automata for modeling lexical analysis and text editors.	Apply
CO 2	**Extend** regular expressions and regular grammars for parsing and designing programming languages.	Understand
CO 3	**Illusrate** the pumping lemma on regular and context free languages for perform negative test.	Understand
CO 4	**Demonstrate** context free grammars, normal forms for generating patterns of strings and minimize the ambiguity in parsing 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, complex problems.	Apply

IV. SYLLABUS:

MODULE -I	FINITE AUTOMATA	Classes: 10

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.

MODULE -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.

MODULE -III	CONTEXT FREE GRAMMARS	Classes: 8

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	Classes: 9

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	Classes: 10

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:

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

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.

Web References:

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

E-Text Books:

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

MOOC Course

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