

14CST52 THEORY OF COMPUTATION

(Common to CSE & IT branches)

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Pre-requisites: Discrete Mathematics

UNIT – I

9

Automata and Regular Expressions: Introduction to formal proof -Finite Automata (FA) Deterministic Finite Automata (DFA)– Non-deterministic Finite Automata (NFA) – Finite Automata with Epsilon transitions.

UNIT – II

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Regular Expressions and Languages: Regular expression – FA and regular expressions – Proving languages not to be regular – Closure properties of regular languages – Equivalence and minimization of automata.

UNIT – III

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Context Free Grammar and Languages: Context-Free Grammar (CFG) – Parse trees – Ambiguity in grammars and languages. Definition of the pushdown automata – Languages of pushdown automata – Equivalence of pushdown automata and CFG- Deterministic pushdown automata.

UNIT – IV

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Context Free Languages and Turing Machines: Normal forms for CFG- Chomsky Normal Form and Greibach Normal Form – Pumping lemma for CFL. Turing machines – Programming techniques for Turing machines.

UNIT - V

9

Undecidability: A language that is not Recursively Enumerable (RE) – An undecidable problem that is RE – Undecidable problems about Turing machine – Post's correspondence problem-The classes P and NP – Kruskal's algorithm – The traveling salesman problem.

Lecture: 45, Tutorial: 15, TOTAL: 60

TEXT BOOKS:

1. Hopcroft J.E., Motwani R. and Ullman J.D., "Introduction to Automata Theory, Languages and Computations", 3rd Edition, Pearson Education, New Delhi, 2008.
2. Martin J., "Introduction to Languages and the Theory of Computation", 4th Edition, Tata McGraw-Hill, New Delhi, 2010.

REFERENCE BOOKS:

1. Lewis H.R. and Papadimitriou C.H., "Elements of the Theory of Computation", 2nd Edition, Pearson Education / PHI, New Delhi, 2007.
2. Linz P., "Introduction to Formal Language and Computation", 4th Edition, Narosa Publishing, 2007.
3. Nasir and Sirmani, "A Text Book on Automata Theory", Cambridge University Press, 2008.
4. Kamala Krithivasan and Rama R., "Introduction to Automata Theory, Formal Languages and Computation", 1st Edition, Pearson Education, 2009.
5. Kavi Mahesh, "Theory of Computation : A Problem-Solving Approach", International Edition, Wiley India Pvt. Ltd., 2011.

Course Outcomes:

On completion of the course the students will be able to

- apply induction and contradiction methods for theorem proving
- identify regular languages and context Free Languages using formal tools
- explain the relation between regular language and context free language and corresponding recognizers
- differentiate problems in terms of complexity/computability using Turing machines
- develop a theoretical model for problem solving situations in related areas of theoretical computer science