

Course No: MCA-5T2
Course Title : Theory of Computation & Formal Languages

Unit I

Basic concepts of theory of computation: Alphabets, Strings, and Representations, Formal Languages and Grammars, Finite State Transducers, Finite-State Automata and Regular Languages, Limitations of Finite-Memory Programs, Closure Properties for Finite-Memory Programs, Decidable Properties for Finite-Memory Programs.

Unit II

Recursive finite-domain programs, Recursion, Pushdown Transducers, Context-Free Languages, Limitations of Recursive Finite-Domain Programs, Closure Properties for Recursive Finite-Domain Programs.

Unit III

Turing Machines. Programs and Turing Transducers, Non-Determinism versus Determinism, Universal Turing Transducers, Un-decidability. Decidable Properties for Recursive Finite-Domain Programs.

Unit IV

Introduction to resource-bounded computation, Time and Space, A Time Hierarchy, Nondeterministic Polynomial Time, More *NP*-Complete Problems, Polynomial Space, *P*-Complete Problems.

Suggested Readings:

1. Hopcroft, J., and Ullman, J. (1979), "*Introduction to Automata Theory, Languages and Computation*", Pearson Education.
2. Hopcroft J, R. Motwani, and J. Ullman, "Introduction to Automata Theory, Languages and Computation, 3rd Ed. 2006, Pearson Education.
3. P. Linz, "Introduction to Formal Languages and Automata", 3rd Ed. 2000, Jones and Barlett, PWS Publishing Company.
4. Donald Knuth, "The Art of Computer Programming", Prentice Hall.