CS 010 406: Theory of Computation

Teaching scheme Credits: 4

Module I (10 hours)

Proving techniques-Mathematical induction -Diagonalization principle –Pigeonhole principle-Functions – Primitive recursive and partial recursive functions – Computable and non computable functions—-Formal representation of languages – Chomsky Classification.

Module II (13 hours)

Introduction to Automata theory – Definition of Automation – Finite Automata –Language acceptability by Finite Automata –Deterministic and Nondeterministic finite automation - Regular Expressions – Finite Automation with $\in$-Transitions –Conversion of NFA to DFA - Minimisation of DFA-DFA to Regular Expressions conversion-pumping lemma for regular languages – Applications of finite automata-NFA with o/p (moore /mealy).

Module III (12 hours)

Context Free Grammar –Simplification of CFG-Normal forms-Chomsky Normal form and Greibach Normal form- pumping lemma for Context free languages- Applications of PDA - Pushdown Automata – Formal definition – Language acceptability by PDA through empty stack and final state – Deterministic and nondeterministic PDA – designing of PDA.

Module IV (13 hours)

Turing Machines – Formal definition – Language acceptability by TM –TM as acceptors, Transducers - designing of TM- Two way infinite TM- Multi tape TM - Universal Turing Machines- Church's Thesis-Godelization.- - Time complexity of TM - Halting Problem - Rice theorem - Post correspondence problem-Linear Bounded Automata.

Module V (12 hours)

Complexity classes- Tractable problems– Class P –P Complete-Reduction problem - Context grammar nonempty-Intractable problems- Class NP – NP Complete- Cooks theorem-Reduction problems-SAT-Clique-Hamiltonian-TSP-Vertex Cover-NP Hard problems.