PIT4I104 FORMAL LANGUAGE AND AUTOMATA THEORY

Module – I (10 Hrs)

Mathematical preliminaries: Alphabet, String, Languages, Grammars, Strings and operations on strings.
Finite Automata: Definition, Basic model, Types of Finite Automata, NFA vs. DFA, NFA to DFA conversion, Eliminating ε-transitions from NFA, NFA as a language acceptor, Minimization of Finite Automata, Design of DFA.

Module – II (10 Hrs)

Regular Expressions: Operators in Regular expressions, Building Finite Automata from Regular expression, Arden's theorem, Building Regular expression from Finite Automata, Pumping Lemma for Regular languages, Closure properties of Regular languages.CYK algorithm.
Context Free Grammars: Derivation and Parse Trees, Ambiguity, Elimination of Ambiguity, Simplification of a CFG, Chomsky and Greibach Normal Forms. Closure and Decision Properties of CFL, Pumping Lemma for CFL.

Module – III (12 Hrs)

Push Down Automata: Basic Model, Components, Moves of a PDA, ID of a PDA, Design of a PDA, PDA to CFG and CGA to PDA conversion.
Turing Machines: Model, Components, move of a TM, ID of TM, design of a TM, Recursively Enumerable Languages, Variation of Turing Machine model, Universal Turing Machine and Undecidable problems, Undecidability of Post correspondence problem.
Linear Bounded Automata and Context Sensitive Languages, Chomsky's Hierarchy of Languages.

Module – IV (08 Hrs)

Primitive Recursive functions: μ- Recursive functions, Cantor and Godel numbering, Ackermann's function, Excursiveness of Ackermann and Turing computable functions. Church Turing hypothesis, Recursive and Recursively Enumerable sets, NP Completeness: P and NP, NP complete and NP Hard problems.

Text Books:

1. Introduction to Automata Theory, Languages and Computation: J. E. Hopcroft, J. D Ullman, Pearson Education.
2. Formal Language and Automata Theory, C. K. Nagpal, Oxford University Press.

Reference Books:

1. Introduction to Formal Languages, Automata Theory and Computation, K. Kirthivasan, Rama R, Pearson Education.
2. Introduction to Languages and the Theory of Computation, Martin, Tata Mc-Graw Hill.
3. Theory of Computation, V. Kulkarni, Oxford University Press.
4. Elements of Theory of Computation, Lewis, PHI.
5. Introduction to the theory of computation, Michael Sipser, Cengage Learning.