CS 504: THEORY OF COMPUTATION (3-0-0: 3)

Background: Inductive Proofs , Relations and Functions, Diagonalization Proofs

Regular Languages: DFA, NFA, and NFA-ε Machines, Equivalence of DFA and NFA Machines, Equivalence of NFA and NFA-ε Machines, Regular Expressions, Equivalence of Regular Expressions and Finite State Machines, Closure Properties of Regular Languages, Pumping Lemma for Regular Languages, Proving Non-Regularity, Decision Problems for DFAs and Regular Languages.

Context-free Languages: Context-free Grammars, Derivations, Leftmost, Rightmost, Inherent Ambiguity, Parse Trees, Normal Forms, etc, Proof of Containment of the Regular Languages, Pushdown Automata, PDA String Acceptance by Empty Stack, and Acceptance by Final State, Equivalence of the Two Methods of PDA Acceptance, Equivalence of PDAs and Context-free Grammars, Closure Properties of Context-free Languages, Pumping Lemma for Context-free Languages, Proving Some Languages are not Context-free.

Recursive and Recursively Enumerable Languages: Turing Machines, Definition of Recursive and Recursively Enumerable, Church's Hypothesis, Computable Functions, Methods for Turing Machine Construction , Modifications of the Basic Turing Machine Model; Multiple Tape, Multiple Tracks, Non-determinism, etc, Equivalence of the Different TM Models and the Basic TM Model, TMs as Enumerators, Characterization of Recursive and Recursively Enumerable Sets, Enumerators, Decidability, Undecidability , Closure Properties of Recursive and Recursively Enumerable Languages, Non-Recursively Enumerable and Non-Recursive Languages, The Halting Problem, Undecidability of the Halting Problem. the classes P and NP; NP-Completeness; satisfiability and Cook's theorem.

Text Books and References

1. Hopcroft, Motwani, and Ullman, “Introduction to Automata Theory, Languages, and Computation”, Pearson Publication
2. Lewis H.P. & Papadimition C.H., “Elements of Theory of Computation,” Pearson Publication.
3. Peter Linz, “An introduction to Formal Languages and Automata”, Narosa Publication.