

THEORY OF COMPUTATION SYLLABUS

Module 1: Introduction to Languages and Grammars

- Recall on Proof Techniques in Mathematics
- Overview of Computational Models
- Languages and Grammars
- Alphabets
- Strings
- Operations on Languages
- Overview of Automata

Module 2: Finite State Automata

- Finite Automata (FA)
 - Deterministic Finite Automata (DFA)
 - Non-deterministic Finite Automata (NFA)
 - NFA with Epsilon Transitions
 - NFA without Epsilon Transitions
- Conversion of NFA to DFA
- Equivalence of NFA and DFA
- Minimization of DFA

Module 3: Regular Expressions and Languages

- Regular Expressions
- FA and Regular Expressions
 - FA to Regular Expression
 - Regular Expression to FA
- Pattern Matching and Regular Expressions
- Regular Grammar and FA
- Pumping Lemma for Regular Languages
- Closure Properties of Regular Languages

Module 4: Context-Free Grammars

- Context-Free Grammar (CFG)
- Derivations
- Parse Trees
- Ambiguity in CFG
- CYK Algorithm
- Simplification of CFG
 - Elimination of Useless Symbols
 - Unit Productions
 - Null Productions
- Normal Forms for CFG
 - Chomsky Normal Form (CNF)
 - Greibach Normal Form (GNF)
- Pumping Lemma for Context-Free Languages (CFL)
- Closure Properties of CFL

Module 5: Pushdown Automata

- Definition of Pushdown Automata
- Languages of Pushdown Automata
- Power of Non-Deterministic Pushdown Automata
- Power of Deterministic Pushdown Automata

Module 6: Turing Machines

- Turing Machines as Acceptor and Transducer
- Multi-Head and Multi-Tape Turing Machines
- Universal Turing Machine
- The Halting Problem
- Turing-Church Thesis

Module 7: Recursive and Recursively Enumerable Languages

- Recursive Languages
- Recursively Enumerable Languages
- Languages that are Not Recursively Enumerable (RE)
- Computable Functions
- Chomsky Hierarchy
- Undecidable Problems
- Post's Correspondence Problem



PAJAMA PADHAI