**Lecture –Plan**

Class: 4th Semester Faculty Name:Amit Kumar Srivastava

Subject: Theory of Automata & Formal Language Subject Code: KCS-403

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| **Unit** | **Detailed Topic** | **Lecture** | **Remark** |
| **1** | Introduction to Theory of Computation- Automata, Alphabet, Symbol, String, Formal Languages | 2 |  |
| Deterministic Finite Automaton (DFA)- Definition, Representation, Acceptability of a String and Language | 2 |
| Nondeterministic Finite Automaton (NFA), Equivalence of DFA and NFA | 2 |
| NFA with ε-Transition, Equivalence of NFA’s with and without ε-Transition | 2 |
| Finite Automata with output- Moore Machine, Mealy Machine | 2 |
| Equivalence of Moore and Mealy Machine | 1 |
| Minimization of Finite Automata, Myhill-Nerode Theorem | 1 |
| **2** | Regular Expressions, Transition Graph, Kleen’s Theorem | 1 |
| Finite Automata and Regular Expression- Arden’s theorem, Algebraic Method Using Arden’s Theorem | 2 |
| Regular and Non-Regular Languages- Closure properties of Regular Languages | 2 |
| Pigeonhole Principle, Pumping Lemma, Application of Pumping Lemma, | 2 |
| Decidability- Decision properties, Finite Automata and Regular Languages, | 2 |
| Simulation of DFA and NFA ,Regular Languages and Computers,  Simulation of Transition Graph and Regular language. | LAB |
| **3** | Context Free Grammar(CFG)-Definition, Derivations, Languages | 2 |
| Derivation Trees and Ambiguity | 2 |
| Regular Grammars-Right Linear and Left Linear grammars | 1 |
| Conversion of FA into CFG and Regular grammar into FA, | 2 |
| Simplification of CFG, | 1 |
| Normal Forms- Chomsky Normal Form(CNF), Greibach Normal Form (GNF), | 2 |
| Chomsky Hierarchy, Programming problems based on the properties of CFGs. | 1 |
| **4** | Nondeterministic Pushdown Automata (NPDA)- Definition, Moves, A Language Accepted by NPDA, | 2 |
| Deterministic Pushdown Automata (DPDA) and Deterministic Context free Languages (DCFL), . | 2 |
| Pushdown Automata for Context Free Languages, Context Free grammars for Pushdown Automata, | 2 |
| Two stack Pushdown Automata | 2 |
| Pumping Lemma for CFL | 1 |
| Closure properties of CFL | 1 |
| Decision Problems of CFL,  Programming problems based on the properties of CFLs. | 1 |
| 5 | Basic Turing Machine Model, Representation of Turing Machines, Language Acceptability of Turing Machines | 2 |
| Techniques for Turing Machine Construction, Modifications of Turing | 2 |
| Turing Machine as Computer of Integer Functions, Universal Turing machine, | 2 |
| Linear Bounded Automata, Church’s Thesis, Recursive and Recursively Enumerable language, Halting Problem, | 2 |
| Post’s Correspondence Problem, | 2 |

Text books and Supplementary reading:

R1 Hopcroft, Ullman, “Introduction to Automata Theory, Languages and Computation”, Pearson Education

R2 Peter Linz, "An Introduction to Formal Language and Automata", Narosa Publishing house.

R3 Papadimitrou, C. and Lewis, C.L., “Elements of the Theory of Computation”, Pearson Education

R4 K. Krithivasan and R. Rama; Introduction to Formal Languages, Automata Theory and Computation; Pearson Publication.

R5 Hop croft, Ullman, “Introduction to Automata Theory, Languages and Computation”, Pearson Education.

R6 “Introduction to Languages and The Theory of Computation” by John Martin.