**19CSE214 Theory of Computation L-T-P-C: 3-0-0-3**

**Course Outcomes:**

CO1.Design and develop of various Finite state machines

CO2.Demonstrate the pushdown automata model for a given language.

CO3.Understand and design the various types of Turing machine.

CO4.Analyze the properties of different languages

CO5.Understand the concepts of undecidability.

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| **Lecture No(s)** | **Topics** | **Keywords** | **Objectives** | **Lecture Time** | **Mode of Delivery** | **Course Outcome - BTL (CO#)** |
| 1-3 | Introduction to Automata and Languages: Chomsky hierarchy of languages | Mathematical Preliminaries and Notation and the basic concept of languages, grammars & automata | To understand the basics of automata and languages | 20-25 Mins for each lecture | 1. MS Teams-Live Presentation 2. MS whiteboard for problem discussion | CO1 – L1  CO2 ­­– L1  CO4\_­­– L1 |
| 4-11 | Finite Automata | DFA, NFA | To design NFA & DFA from the description, to identify the description of NFA & DFA | 25 Mins for each lecture | 1. MS Teams-Live Presentation 2. MS whiteboard for problem discussion | CO1 - L3 |
| Equivalence of DFA and NFA, Reduction of the number of states in DFA | conversion between NFA & DFA | 25 mins for each lecture | 1. MS Teams-Live Presentation 2. MS whiteboard for problem discussion | CO1 - L3 |
| Quiz-1-AUMS | | | | | | |
| 12-18 | Regular languages & expressions, and Conversions | Regular expressions for the descriptions of regular languages | To determine the language represented by a regular expression, Construction of RE from FA | 25 mins for each lecture | 1. MS Teams-Live Presentation 2. MS whiteboard for problem discussion | CO4 – L2 |
| 19 | Regular grammars | Regular languages and grammars, Right-and Left linear grammars, Right-linear grammars generate the regular language and Right-linear grammars for regular languages | To study about the regular grammars to represent regular languages | 25 mins for each lecture | 1. MS Teams-Live Presentation 2. MS whiteboard for problem discussion | CO4- L3 |
| Tutorial-1-AUMS | | | | | | |
| 20-21 | Properties of Regular Languages | Closure of the simple set operation,  Pumping Lemma for regular languages | Use the pumping lemma for regular languages to show that some languages are not regular | 25 mins for each lecture | 1. MS Teams-Live Presentation 2. MS whiteboard for problem discussion | CO4- L3 |
| Other properties of regular languages | Homomorphic image, right quotient and Pigeonhole principle | To explore about other properties of the languages |  |
| Periodical-1(viva-case study) | | | | | | |
| 22-24 | Context-Free Languages | CFG, Derivations and Ambiguity, CFG and Programming languages | To learn about Context-Free Languages | 25 mins for each lecture | 1. MS Teams-Live Presentation 2. MS whiteboard for problem discussion | CO4 - L3 |
| 25-30 | Simplification of CFG and Normal Forms | Methods for transforming grammars, Normal forms (CNF, GNF), CYK algorithm | To study about normal forms | 25 mins for each lecture | 1. MS Teams-Live Presentation 2. MS whiteboard for problem discussion | CO4 - L3 |
| Quiz-2-AUMS | | | | | | |
| 31–36 | Pushdown Automata | Non-deterministic Pushdown Automata, | Construct a PDA to accept a given language, CFL to pushdown automata | 25 mins for each lecture | 1. MS Teams-Live Presentation 2. MS whiteboard for problem discussion | CO2 - L3 |
| Pushdown Automata and CFL, DPDA | Construct a PDA to accept a given language, CFL to pushdown automata | 25 mins for each lecture | 1. MS Teams-Live Presentation 2. MS whiteboard for problem discussion | CO2 - L3 |
| Tutorial-2-AUMS | | | | | | |
| 37 | Properties of CFL | Pumping Lemma for CFL | To know the usage of pumping lemma for CFL | 25 mins for each lecture | 1. MS Teams-Live Presentation 2. MS whiteboard for problem discussion | CO4 - L3 |
| Periodical-2(viva-case study) | | | | | | |
| 38-40 | Turing Machines | The Standard Turing Machine, Turing machine as a transducer, combining Turing machine, Turing’s Thesis | Create a Turing machine to solve a specified problem | 25 mins for each lecture | 1. MS Teams-Live Presentation 2. MS whiteboard for problem discussion | CO3 – L3 |
| Quiz-3-AUMS | | | | | | |
| 41-43 | Non Deterministic Turing Machines | Nondeterministic Turning Machines, Universal Turing Machine, Linear Bounded Automata | To study different types of Turing machine | 25 mins for each lecture | 1. MS Teams-Live Presentation 2. MS whiteboard for problem discussion | CO3 – L3 |
| 44-45 | Computability and undecidability | Post Correspondence Problem (PCP), reducibility | Determine whether a problem about Turing machine is solvable or undecidable.  Describe the role of Turing machines in computer science, and the meaning of decidability, undecidability and Turing recognizability | 25 mins for each lecture | 1. MS Teams-Live Presentation 2. MS whiteboard for problem discussion | CO5 – L1 |
| Endsem | | | | | | |

**Evaluation Pattern**

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| **Case Study (Group)** | **8** |
| **Tutorial & Quizzes** | **12** |
| **Periodicals(I & II)** | **30(5+10; 5+10)** |
| **EndSem-online quiz** | **20** |
| **Viva** | **30** |
| **Total** | **100** |