



# CLUSTER UNIVERSITY OF SRINAGAR

## Syllabus for PG Information Technology

### Batch 2023

**Course Code:**

**Credits: 4 (L- 3, T- 1, P-0)**

**Contact Hrs: 75 (Theory: 45, Tutorial: 15)**

**3<sup>rd</sup> SEMESTER: M.Sc. (IT) Batch 2023 & Onwards**

**Title: Theory of Automata [Core 2] Max. Marks: 100**

**Theory External: 60; Min Marks: 24**

**Theory Internal (Continuous Assessment): 15 Marks,  
Min Marks: 06**

**Practical Experimental Basis= 15, Min. Marks: 06**

**Practical Experimental (Continuous assessment) =10**

**Min. Marks: 04**

#### **COURSE OBJECTIVES:**

1. To be able to construct finite state machines and the equivalent regular expressions.
2. To understand the class of languages described by finite state machines and regular expressions.
3. To understand and construct pushdown automata and the equivalent context free grammars.
4. To understand the concept of construct Linear bounded automata and the equivalent context Sensitive grammars.
5. To understand the concept of Turing Machine and Universal Turing machine

#### **Syllabus**

**UNIT I** Introduction to Set Theory, Introduction to Automata, Alphabets, String, Languages, Strings, Relations, Counting Principles, Alphabets, Languages, Kleene Closure. Finite Automata-Deterministic and Non-Deterministic Automata, Processing of Strings, Transforming NFA to DFA, NFA with  $\epsilon$ -Transitions. Minimization of DFA's, Conversion of DFA to NDFA, Overview of e-NDFA. DFA vs NDFA vs e-NDFA

**UNIT II** Finite Automata & Regular Expressions: Definition, Basic Regular Expressions, Obtaining regular expression: Using Basics Expressions & State Elimination Method, Application of regular Expressions, Regular Languages: Definition, Properties, and Pumping Lemma for Regular Languages, Decidable and Closure properties of Regular languages. Limitation of Finite Automata, Equivalence & minimization of DFA, Automata with output-Moore and Mealy Machines.

**UNIT III** Context Free Grammars and Languages, Parse Trees, Ambiguity in grammars, Simplified Context free grammar and its Normal Form, Reduction of context free grammars, Chomsky and Greibach Normal form, Generation of Grammar from Finite Automata & Regular Expressions, Derivation Trees, Left most and Right Most Derivation Trees ,Applications and properties of context free languages , Introduction to Push down Automata, Transition & Graphical Representation.



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**UNIT IV** Introduction to Linear bounded Automata & Turing Machine. Turing machine model, transition table Instantaneous definition, Acceptance and Construction of Turing machine. Standard Turing machine, Transducers, Lexical and Syntax Analyse: Parsing, Top down Parsing (Predictive parsers, LL (K), recursive Descent) and Bottom up Parsing (LR (K)), Polynomial Time Algorithms Concept, Concept of P and NP.

#### **SUGGESTED READING:**

1. *Introduction to the Theory of Computation, Third Edition Michael Sipser, Cengage Learning, ISBN-13: 978-1-133-18779-0*
2. *Cohen, D. I. A. (2003). Introduction to computer theory (2nd ed., ISBN: 8126513349). New Delhi, India: McGraw-Hill Education.*
3. *Formal Languages and Automata Theory by Peter Linz (3rd edition, 2011)*

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