FORMAL LANGUAGES AND AUTOMATA THEORY

[Revised Credit System]

(Effective from the academic year 2018-19)

SEMESTER - IV

Subject Code	**CSE 2254**	**IA Marks**	**50**
Number of Lecture Hours/Week	**03**	**Exam Marks**	**50**
Total Number of Lecture Hours	**36**	**Exam Hours**	**03**

CREDITS - 03

Course objectives: This course will enable students

- Understand the mathematical meaning of Grammar
- Know how to generate Languages using grammars
- Design Automata for various languages

Module -1	**Teaching Hours**
INTRODUCTION TO THE THEORY OF COMPUTATION AND FINITE AUTOMATA: Three basic concepts, Some Applications, Deterministic Finite Accepters, Nondeterministic Finite Accepters, Equivalence of Deterministic and Nondeterministic Finite Accepters, Reduction of the Number of States in Finite Automata. **Text Book 1**: Chapter 1:1.2 - 1.3, Chapter 2: 2.1 - 2.4	**08 Hours**
Module -2	
REGULAR LANGUAGES, REGULAR GRAMMARS AND PROPERTIES OF REGULAR LANGUAGES: Regular Expressions, Connection between Regular Expressions and Regular Languages, Regular Grammars, Closure Properties of Regular Languages, Identifying Non-regular Languages. **Text Book 1:** Chapter 3: 3.1 -3.3, Chapter 4: 4.1, 4.3	**07 Hours**
Module - 3	
CONTEXT-FREE LANGUAGES AND SIMPLIFICATION OF CONTEXT-FREE GRAMMARS AND NORMAL FORMS:	**07 Hours**

Context-Free grammars, Parsing and Ambiguity, Context-Free Grammars and programming languages, Methods for Transforming Grammars, Two important Normal Forms. **Text Book 1:** Chapter 5: 5.1 -5.3, Chapter 6: 6.1 – 6.2	
Module-4	
PUSHDOWN AUTOMATA AND PROPERTIES OF CONTEXT-FREE LANGUAGES: Nondeterministic Pushdown Automata, Pushdown Automata and Context–Free Languages, Deterministic Pushdown Automata and Deterministic Context-Free Languages, Two Pumping Lemmas, Closure properties and Decision Algorithms for Context-Free Languages. **Text Book 1:** Chapter 7: 7.1 – 7.3, Chapter 8: 8.1 -8.2	**06 Hours**
Module-5	
TURING MACHINES AND OTHER MODELS OF TURING MACHINES: The Standard Turing Machine, Nondeterministic Turing Machines, Linear Bounded Automata. **A HIERARCHY OF FORMAL LANGUAGES & AUTOMATA** Recursive and Recursively Enumerable Languages, Unrestricted grammars, Context-Sensitive Grammars and Languages, The Chomsky Hierarchy. **Text Book 1:** Chapter 9: 9.1, Chapter 10:10.3, 10.5, Chapter 11: 11.1-11.4	**08 Hours**
Course outcomes:	
After studying this course, students will be able to: 1. Understand various applications of Grammars, Languages and Automata 2. Design Grammars, Languages and Automata for various computational problems.	
Text Books: 1. Peter Linz, *An Introduction to Formal Languages and Automat*, (6e), Jones & Bartlett Learning, 2016.	

Reference Books:

1. John C Martin, *Introduction to Languages and the Theory of Computation*, (3e), McGraw Hill, India, 2007.
2. J E Hopcroft, Rajeev Motwani & Jeffrey D Ullman, *Introduction to Automata Theory, Languages and Computation*, (3e), Pearson Education, 2006.
3. K.L.P. Mishra, N.Chandrashekharan, *Theory of Computer Science*, (3e), PHI publications, 2007.
4. Michael Sipser, *Theory of Computation*, Cengage Learning, 2007.