

# Semester VII

## DISCIPLINE SPECIFIC ELECTIVE COURSE (DSE):

### CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Theory of Computation (DSE)	4	3	1	0	Class XII pass	Programming languages and linear algebra

#### Learning Objectives

The objective is to introduce students to the mathematical foundations of computation including automata theory; the theory of formal languages and grammars; the notions of algorithm, decidability, complexity, and computability.

#### Learning outcomes

After completing this course, student should be able to;

- Understanding of Sets and Graphs
- Understanding and implementation of Digital abstraction
- Philosophy of automata and machine
- Exposure to the Combinatorial Logic
- Exposure to turing machine
- Introduction to Context-free languages and their significance

#### SYLLABUS

Unit 1 : Need for automata theory - Introduction to formal proof – Finite Automata (FA) – Deterministic Finite Automata (DFA) – Non-deterministic Finite Automata (NFA) – Equivalence between NFA and DFA – Finite Automata with Epsilon transitions – Equivalence of NFA and DFA- Equivalence of NFAs with and without  $\epsilon$ -moves- Conversion of NFA into DFA – Minimization of DFAs. (12 hours)

Unit 2 : Regular expression – Regular Languages- Equivalence of Finite Automata and regular expressions – Pumping Lemma – Closure properties of regular languages. (9 hours)

Unit 3: Types of Grammar - Chomsky’s hierarchy of languages -Context-Free Grammar (CFG) and Languages – Derivations and Parse trees – Ambiguity in grammars and languages – Push Down Automata (PDA) (9 hours)

Unit 4: Normal forms for CFG – Simplification of CFG- Chomsky Normal Form (CNF) and Greibach Normal Form (GNF) – Pumping lemma for CFL – Closure properties of Context Free Languages –Turing Machine : Basic model – definition and representation , Recursive and recursively enumerable languages – Properties (12 hours)

### Essential/recommended readings

1. Introduction to Automata Theory, Languages, and Computation, John E. Hopcroft, Rajeev Motwani, Jeffrey D Ullman, 3rd Edition, 2013
2. Introduction To Computer Theory, Daniel I. A. Cohen, 2nd Edition, 2007
3. Computation Structures. Stephen Ward & Robert Halstead, MIT Electrical Engineering and Computer Science, 1989.
4. Discrete computational structures, Robert R. Korfhage, Academic Press, 1974
5. Peter Linz, "An Introduction to Formal Language and Automata", 6th Edition, Jones & Bartlett, 2016.
6. K.L.P.Mishra and N.Chandrasekaran, “Theory of Computer Science: Automata Languages and Computation”, 3rd Edition, Prentice Hall of India, 2006.

**Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.**

### DISCIPLINE SPECIFIC ELECTIVE COURSE (DSE):

#### CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Computational Social Systems (DSE)	4	3	1	0	Class XII pass	Programming languages and Artificial intelligence

### Learning Objectives

This interdisciplinary course encompasses the recent groundbreaking research and its applications to the interface of machines, society, and human beings. The course uses present-day digital technologies, data science, and artificial intelligence techniques and approaches in several fields. The course also deals with making data-driven processes more