



**FIRST SEMESTER 2022-2023**

Course Handout Part II

**Date: 29.08.2022**

In addition to Part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No.	:	<b>CS F351</b>
Course Title	:	<b>Theory of Computation</b>
Instructor-in-Charge	:	<b>Dr. Raghunath Reddy M</b>
Instructors	:	<b>Dr. Jabez Christopher, Ms. Kavya, Mr. Vishwanath Reddy, and Ms. Simran K</b>

**1. Scope and Objectives of the Course:**

The scope of this course includes- Languages; Finite automata and regular languages- Regular Expressions, Deterministic and Non-deterministic FA, Conversion from NDFA to DFA, Pumping theorem; Context free languages and CFGs- Push down automata, concepts in parsing, parse trees, Turing machines; Universal Turing Machines; Computability – decidability and semi-decidability, recursive languages, Church-Turing hypothesis; Undecidable problems – the halting problem.

The objectives of the course are

- To provide a mathematical, i.e., proof-oriented foundation for the process of computations performed by computers.
- To impart an understanding of the notions of automata, formal languages, grammars.
- To understand the capabilities and limitations of computing machines.

**2. Textbooks:**

T1: Elements of Theory of Computation, Harry Lewis and Christos Papadimitriou, Second Edition, PHI, Asia 1998.

**3. Reference books:**

R1: J.E. Hopcroft and J. D. Ullman, Introduction to Automata Theory, Languages and Computation, Narosa, 1979.

R2: Jeffery Shallit, A second course in formal languages and automata theory, Cambridge University Press, 2008

R3: D. C. Kozen, Automata and Computability, Springer-Verlag, 1997.

R4: J.E. Hopcroft, R. Motwani and J. D. Ullman, Introduction to Automata Theory, Languages and Computation, Pearson, 2001

R5: M Sipser, Introduction to the Theory of Computation, Thomson Asia, 1997.

**Online Study Material:**

NPTEL courses e.g. Theory of Computation, Formal Languages and Automata Theory



#### 4. Course Plan:

Lecture No.	Learning objectives	Topics to be covered	Chapter in the Text Book
1	To introduce the course theory of computation	Introduction to Languages and Operations Applicable to Languages.	T1 Chapter 1, R1 Chapter 1
2-5	To understand finite automata	Finite Automata: DFA and NFA	T1 Chapter 2, R1 Chapter 2
6-9		Regular Expression, $NFA \Leftrightarrow RE \Leftrightarrow$ Regular Grammar, Closure Properties of Regular languages	T1 Chapter 2, R1 Chapter 2
10-13		Pumping Lemma, Myhill-Neorode Theorem, State Minimization	T1 Chapter 2, R1 Chapter 3
14-16	To understand push down automata	Context Free Grammar, Derivation Tree, Various Normal Forms of CFG	T1 Chapter 3, R1 Chapter 4
17-19		PDA, $PDA \Leftrightarrow CFG$ , Context Free Languages	T1 Chapter 3, R1 Chapter 5
20-23		Properties of Context Free Languages; Pumping Lemma, Ogden's Lemma, Closure Properties, Decision Properties	T1 Chapter 3, R1 Chapter 6
24-25		Deterministic CFL	R1 Chapter 10
26-29	To understand Turing machine	Definition, Turing Computable Functions, Non-deterministic Turing Machine, Variants of TM, Recursive and Recursive Enumerable Languages, Universal TM	T1 Chapter 4, R1 Chapter 7
30-34		Undecidable Problems and Rice Theorem	T1 Chapter 5, R1 Chapter 8
35-36		Chomsky Hierarchy	R1 Chapter 9
37-40	To understand time complexity classes	P, NP, NP-Completeness, co-NP	T1 Chapter 6-7, R1 Chapter 13

#### 5. Evaluation Scheme:



Component	Duration	Weightage (%)	Date & Time	Nature of Component
Quiz-1	30 mins	10%	To be announced (before mid-sem)	Closed Book
Quiz-2	30 mins	10%	To be announced (after mid-sem)	Closed Book
Assignment-1	Take Home	10%	To be announced (before mid-sem)	Open Book
Assignment-2	Take Home	10%	To be announced (after mid-sem)	Open Book
Mid-Sem	90 mins	25%	01/11/2022 1:30 PM – 3:00 PM	Closed Book
Comprehensive Examination	180 mins	35%	21/12 FN	Closed Book

**6. Mid-Semester grading:** Minimum 40% weightage will be considered for the mid-semester grading.

**7. Chamber Consultation Hour:** to be announced in the class.

**8. Notices:** All notices about the course will be put on CMS.

**9. Make-up Policy:** Make-up will be granted only to genuine cases with prior permission from the IC.

**10. Academic Honesty and Integrity Policy:** Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

**INSTRUCTOR-IN-CHARGE**

**Raghunath Reddy M**

