Birla Institute of Technology & Science, Pilani
Hyderabad Campus

FIRST SEMESTER 2023-2024

Course Handout Part II

Date: 11.08.2023

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.	:	**CS F351**
Course Title	:	**Theory of Computation**
Instructor-in-Charge	:	**Dr. Raghunath Reddy M**
Instructors	:	**Prof. Gururaj**

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

a) To provide a mathematical, i.e., proof-oriented foundation for the process of computations performed by computers.

b) To impart an understanding of the notions of automata, formal languages, grammars.

c) To understand the capabilities and limitations of computing machines.

2. Textbooks:

T1: J.E. Hopcroft and J. D. Ullman, Introduction to Automata Theory, Languages and Computation, Narosa, 1979.

3. Reference books:

R1: Elements of the Theory of Computation, Harry Lewis and Christos Papadimitriou, Second Edition, PHI, Asia 1998.

R2: M Sipser, Introduction to the Theory of Computation, Thomson Asia, 1997.

R3: Jeffery Shallit, A second course in formal languages and automata theory, Cambridge University Press, 2008

R4: D. C. Kozen, Automata and Computability, Springer-Verlag, 1997.

R5: J.E. Hopcroft, R. Motwani and J. D. Ullman, Introduction to Automata Theory, Languages and Computation, Pearson,3rd edition, 2001

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
1-2	To introduce the course theory of computation	Introduction to Languages and Operations Applicable to Languages.	T1 Chapter 1, R1 Chapter 1
3-5	To understand finite automata	Finite Automata: DFA and NFA	T1 Chapter 2, R1 Chapter 2
6-9		Regular Expression, NFA RER egula r Gram	T1 Chapter 2, R1 Chapter 2
10-13		Pumping Lemma, Myhill-Neorde Theorem, State Minimization	T1 Chapter 3, R1 Chapter 2
14-16	To understand push down automata	Context Free Grammar, Derivation Tree, Various Normal Forms of CFG	T1 Chapter 4, R1 Chapter 3
17-19		PDA, PDACFG, Context Free Languages	T1 Chapter 5, R1 Chapter 3
20-23		Properties of Context Free Languages; Pumping Lemma, Ogden's Lemma, Closure Properties, Decision Properties	T1 Chapter 6, R1 Chapter 3
24-25		Deterministic CFL	T1 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 7, R1 Chapter 4
30-34		Undecidable Problems and Rice Theorem	T1 Chapter 8, R1 Chapter 5
35-36		Chomsky Hierarchy	T1 Chapter 9
37-40	To understand time complexity classes	P, NP, NP-Completeness, co-NP	T1 Chapter 13, R1 Chapter 6-7

5. Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of Component
Quiz-1	40 mins	12.5%	To be announced (before mid-sem)	Closed Book
Quiz-2	40 mins	12.5%	To be announced (after mid-sem)	Closed Book
Mid-Sem	90 mins	30%	09/10 - 4.00 - 5.30PM	Open Book
Comprehensive Examination	180 mins	45%	07/12 AN	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