



**PES UNIVERSITY, BENGALURU**  
**(ESTABLISHED UNDER KARNATAKA ACT 16 OF 2013)**  
**DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING**  
**SESSION: JAN – MAY, 2020**  
**THEORY OF COMPUTATION – UE18CS254 (3:0:0:0:3)**

Textbook:

1. **An Introduction to Formal Languages and Automata**, Peter Linz, 5<sup>th</sup> Edition, Jones and Bartlett, New Delhi, India, 2011.
2. **Theory of Computation: A Problem-Solving Approach**, Kavi Mahesh, Wiley India, New Delhi, 2012

Hours	Unit	Topic	Chapter & Section	% Coverage	
				Unit	Total
1	1	Introduction: Computers, computation, computability and Languages	T1- 1.2 T2 - 1.1, 1.2, 1.3, 1.7, 1.8	21.15	21.15
2		Deterministic Finite Automata: Definition, start state, final state, internal states, Language of DFA, construction of DFA and string acceptance	T1 – 2.1		
3			T2 - 2.1 – 2.3, 2.9		
4		Non-Deterministic Finite Automata	T1 – 2.2		
5			T2 - 2.12, 3.1 – 3.2		
6		Equivalence of Deterministic and Non-Deterministic Finite Automata	T1 - 2.3		
7					
8		Minimizing Finite Automata	T2- 3.5		
9	2	Regular Expressions, Construction of Regular Expressions	T2- 4.1 – 4.4, 4.7, 4.9	19.23	40.38
10		Equivalence of RegEx & Finite Automata	T2 - 4.5 – 4.6		
11					
12		Regular Grammars	T2 - 5.1 – 5.3		
13		Equivalence of Regular Grammar & Finite Automata	T2 - 5.4 – 5.7		
14					
15		Closure Properties of Regular Languages	T2 - 6.1 – 6.2		
16		Pumping Lemma and identifying Non-Regular Languages	T2 - 6.3 – 6.4		
17	3	Context-Free Languages	T2 - 7.1 – 7.2	21.15	61.53
18		Constructing Context-Free Grammars: Linear & Non – linear	T2 - 7.3 – 7.5		
19					
20		Parsing and Ambiguity	T2 - 7.6 – 7.8		
21					
22		Non-Deterministic Pushdown Automata, Constructing Pushdown Automata	T1 - 7.1		
23			T2 - 8.1 – 8.4, 8.7		
24		Equivalence of Push Down Automata and Context Free Grammars, Conversion CFG to PDA			
25			T1 - 7.2		

26	4	Deterministic Pushdown Automata and Deterministic Context-Free Languages	T1 – 7.3		
27		Conversion to Chomsky Normal Form, A Membership Algorithm for Context-Free Languages	T1 – 6.3		
28			T2 - 7.10		
29		Greibach Normal Form	T2 – 7.11		
30		Closure Properties Context Free Languages	T2 - 9.1 – 9.4	21.15	82.68
31		Pumping Lemma for Context-Free Languages	T2 - 9.5 – 9.6		
32					
33	5	The Standard Turing Machine	T2 - 10.1 – 10.3	17.30	100
34					
35					
36		Constructing Turing Machines	T2 - 10.4 – 10.5		
37					
38		Church-Turing Thesis , Universal Turing Machine	T2 - 10.7, 10.9		
39		Recursive and Recursively Enumerable Languages	T2 - 11.1 – 11.8, 11.13		
40		Diagonalization, Chomsky hierarchy			
41	Post Correspondence Problem, The Halting Problem of Turing Machines	T2 - 12.1, 12.3			
42		Undecidable Problems	T2 - 12.7		

#### Textbook:

**T1 - An Introduction to Formal Languages and Automata**, Peter Linz, 5<sup>th</sup> Edition, Jones and Bartlett, New Delhi, India, 2011.

**T2 - Theory of Computation: A Problem-Solving Approach**, Kavi Mahesh, Wiley India, New Delhi, 2012.

#### References:

**Introduction to Automata Theory, Languages, and Computation**, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, 3<sup>rd</sup> edition, Pearson Education, Delhi, India, 2009.

**Theory of Computation**, Michael Sipser, Cengage Learning, New Delhi, India, 2008.