GANPAT UNIVERSITY									
FACULTY OF ENGINEERING & TECHNOLOGY									
Programme	Bachelor of Technology					Branch/Spec.	Computer Science & Engineering (CBA/ /BDA/CS/CSE)		
Semester	VI					Version	1.1.1.1		
Effective from Academic Year			2024–25			Effective for the batch Admitted in			June 2022
Subject code	2CSE601		Subject Name			Theory of Computation			
Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture (DT)		Practical (Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	1	0	0	4	Theory	40	60	100
Hours	3	1	0	0	4	Practical	00	00	00

Pre-requisites:

Engineering Mathematics, Data structures and Algorithms

Learning Outcome:

After learning the course, the students should be able to:

- Introduce the mathematical foundations of computation including automata theory.
- Differentiate and give examples for the different types of automata like finite automata, push down automata, linear bounded automata and Turing machine.
- Correlate the different types of automata to real world applications.
- Choose and design appropriate automata for the different requirements outlined by theoretical computer science.

Theory syllabus

Unit	Content	Hrs
1	**Review of Mathematical Background** Sets, Functions, Logical statements, Proofs, Relations, Languages, The Principle of Mathematical induction, Recursive definitions.	**3**
2	**Regular Languages and Finite Automata** Regular expressions, Regular languages, Memory required to recognize a language, Finite automata, Distinguishable strings, Union, intersection and complement of regular languages, Automata with output-Moore machine, Mealy machine.	**8**
3	**Nondeterminism and Kleen's Theorem** Non-deterministic finite automata, non-deterministic finite automata with ^ transitions, Kleen's theorem- Part-1	**8**
4	**Regular and Non-Regular Language** Minimization of Finite automata, non-regular and regular languages, Pumping Lemma, Decision problems and decision algorithms, regular languages in relation to programming languages	**8**
5	**Context-Free/Non-Context Free Languages and Push-Down Automata** Context-free languages, Regular Grammars, Derivation tree and ambiguity, An Unambiguous CFG, Simplified and Normal forms, Chomsky normal form, Chomsky Classification of Grammars.	**6**

6	**Pushdown Automata and CFL** Push -Down Automata, Deterministic PDA, Types of acceptances and their equivalence, Equivalence of CFG and PDA, parsing, Non-CFL and CFL, Pumping Lemma for CFL, Intersection and Complement of CFL	**8**
7	**Turing Machine** Models of computation, Combining TMs, Computing a function with TMs. Variations on Turing Machines, doubly infinite and more than one Tapes, Non-deterministic and Universal TM	**4**

Self-Study
Non-deterministic and Universal Turing Machine
Mooc Course
Course Name: Theory of Computation Link: https://nptel.ac.in/courses/106/106/106106049/

Text Books	
1	Introduction to Languages and Theory of Computation: By John C. Martin
Reference Books	
1	Computation: Finite and Infinite: By Marvin L. Minsky, Prentice-Hall
2	Introduction to formal languages: By G. E. Reevsz, Mc-graw hill
3	Introduction to Formal Language Theory: By M.H. Harrison

Course Outcomes:	
COs	Description
CO1	Introduce the mathematical foundations of computation including automata theory
CO2	Differentiate and give examples for the different types of automata like finite automata, push down automata, linear bounded automata and Turing machine
CO3	Correlate the different types of automata to real world applications
CO4	Choose and design appropriate automata for the different requirements outlined by theoretical computer science

Mapping of CO and PO:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	0	1	2	0	0	0	0	0	0	0	1
CO2	2	1	1	2	1	0	0	0	0	0	0	1
CO3	2	1	1	2	2	0	0	0	1	1	1	2
CO4	2	3	2	2	2	0	0	0	1	1	1	2