GANPAT UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

Programme	Bachelor of Technology	Branch/Spec.	Computer Engineering / Information Technology
Semester	VI	Version	2.0.0.0
Effective from Academic Year	2020-21	Effective for the batch Admitted in	July 2018
Subject code	2CEIT601	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	0	1	-	4	Theory	40	60	100
Hours	3	0	2	-	5	Practical	30	20	50

Pre-requisites:

Basic Understanding of Mathematics

Objectives of the course:

1. Explain the models of computation, including formal languages, grammars and automata, and their connections.
2. Identify limitations of some computational models and possible methods of proving them.
3. Have an overview of how the theoretical study in this course is applicable to engineering application like designing the compilers.
4. Course should provide a formal connection between algorithmic problem solving and the theory of automata and develop them into a mathematical view.

Theory syllabus

Unit	Content	Hrs
1	**Review of Mathematical Background:** Sets, Functions, Type of Functions, Logic, Logical Connectives, Quantifiers, Proofs, Relations, Equivalence Relation	02
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, Construction of Mealy and Moore Machine, Conversion From Mealy to Moore Machine and Vice Versa	11
3	**Nondeterminism And Kleen'sTheorem:** Non-Deterministic Finite Automata, Non Deterministic Finite Automata With ^ Transitions, Kleen's Theorem	05
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	07
5	**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	07
6	**Pushdown Automata And CFL:** Push -Down Automata, Definition and Examples, Deterministic PDA, Types of Acceptances and Their Equivalence, Equivalence of CFG and PDA, Introduction to Parsing, Top-Down and Bottom Up Parsing, Non-CFL and CFL, Pumping Lemma for CFL, Intersection and Complement of CFL	06

7	**Turing Machine:** Models of Computation, Tm Definition, Combining Tms, Computing A Function With Tms. Variations on Turing Machines, Doubly Infinite and More Than One Tapes, Non-Deterministic and Universal Tm, The Halting Problem, Acceptability and Decidability.	07

Practical content	
Perform various lex programs using all metacharacters.	
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	Formal language theory: By M. H. Harrison
ICT/MOOCs Reference	
1	https://nptel.ac.in/courses/106106049/
2	https://nptel.ac.in/courses/111103016/
3	https://nptel.ac.in/courses/106/105/106105196/
4	https://nptel.ac.in/courses/106/104/106104028/

Course Outcomes:

After successful completion of this course, student will be able to

1. Demonstrate advanced knowledge of formal computation and its relationship to formal languages.
2. Distinguish different computing languages and classify their respective types.
3. Recognize and comprehend formal reasoning about languages.
4. Show a competent understanding of the basic concepts of complexity theory.