

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY
FACULTY OF TECHNOLOGY & ENGINEERING
DEPARTMENT OF COMPUTER SCIENCE &
ENGINEERING

CS353: THEORY OF COMPUTATION

Credits and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	3	0	1	4	3
Marks	100	0	-	100	

Outline of the Course:

Sr. No.	Title of the unit	Minimum Number of Hours
1	Introduction	01
2	Finite Automata and Regular Languages	16
3	Non - Determinism Finite Automata	07
4	Context free Grammars	10
5	Pushdown Stack Memory Machines	06
6	Turing Machine	05

Total Hours (Theory): 45

Total Hours (Lab): 00

Total Hours: 45

Detailed Syllabus:

1.	Introduction	01 Hours	5 %
	Alphabets, Languages, State, length, Concatenation, Reverse, Null, Strings, Kleene closure, Positive Closure, Concept of Basic machine.		
2.	Finite Automata and Regular Languages	16 Hours	26 %
	Finite Automata and Regular Languages: Deterministic finite automata (DFA), Regular expressions, regular languages, Conversion of DFA to RE and RE to DFA Properties of regular sets applications, Automata with output - Moore machine, Mealy machine, Finite automata, memory requirement in a recognizer, definition, union, intersection and complement of regular languages.		
3	Non - Determinism Finite Automata	07 Hours	20 %
	Non - Determinism Finite Automata (NFA): Non - Determinism Finite Automata, Conversion from NFA to FA, ^- Non Determinism Finite Automata Conversion of NFA- ^ to NFA and equivalence of three Kleene's Theorem, Minimization of Finite automata Regular And Non Regular Languages – pumping lemma.		
4.	Context free Grammars	10 Hours	20 %
	Context free grammar (CFG): Definition, Unions Concatenations And Kleen's of Context free language Regular grammar, Derivations and Languages, Relationship between derivation and derivation trees, Ambiguity Unambiguous CFG and Algebraic Expressions BacosNaur Form (BNF), Normal Form – CNF		
5.	Pushdown Stack Memory Machines	06 Hours	14 %
	Pushdown Automata, CFL And NCFL: Definition, deterministic PDA, Equivalence of CFG and PDA, Pumping lemma for CFL, Intersections and Complements of CFL, Non-CFL		
6.	Turing Machine	05 Hours	15 %
	Turing Machine (TM): TM Definition, Model Of Computation And Church Turning Thesis, computing functions with TM, Combining TM, Variations Of TM, Non Deterministic TM, Universal TM, TM limitations, Halting problem, Undecidability, Recursively and Enumerable Languages, Context sensitive languages and Chomsky hierarchy.		

Course Outcome:

After completion of the course, Students will be able to:

CO1	Apply basic concepts of theory of computation in the computer field in order to solve computational problems.
CO2	Construct algorithms for different problems and argue formally about correctness on different restricted machine models of computation.
CO3	Analyze and design finite automata, pushdown automata and Turing machine for formal languages.
CO4	Apply rigorously formal mathematical methods to prove properties of languages, grammars and automata.
CO5	Identify limitations of some computational models and possible solutions.
CO6	Design context free grammars for formal languages.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	-	-	-	-	-	-	-	-	-	-	3	-
CO2	-	-	3	-	-	-	-	-	-	-	-	-	2	-
CO3	3	2	2	-	-	-	-	-	-	-	-	-	3	-
CO4	2	2	2	-	-	-	-	-	-	-	-	-	1	-
CO5	2	1	1	-	-	-	-	-	-	-	-	-	-	-
CO6	2	-	-	-	-	-	-	-	-	-	-	-	-	-

Recommended Study Material:

❖ Text Books:

1. Introduction to Languages and Theory of Computation, John C. Martin, TMH

❖ Reference Books:

1. An introduction to automata theory and formal languages, Adesh K. Pandey, S. K. Kataria & Sons
2. Introduction to computer theory, Deniel I. Cohen, John Wiley & Sons Inc
3. Computation: Finite and Infinite, Marvin L. Minsky, Prentice-Hall
4. “An introduction to Formal Languages and Automata”, Peter Linz, 6th edition, Jones & Bartlett Learning
5. “Introduction to the Theory of Computation”, Michael Sipser, 3rd edition, Cengage Learning.

❖ Web Materials:

1. http://en.wikipedia.org/wiki/Theory_of_computation

2. https://www.youtube.com/playlist?list=PLEbnTDJUr_IdM_FmDFBz0zCsOF_xfK
4. <http://nptel.ac.in/courses/106103070/>
5. <http://nptel.ac.in/courses/106104028/>
6. <http://nptel.ac.in/courses/106106049/>
7. <https://www.youtube.com/watch?v=4GLC-s0PQLY>