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	-	3	3
Marks	100	0	-	100	

Outline of the Course:

Sr. No.	Title of the unit	Minimum Number of Hours
1	Mathematical Terms and Theory	03
2	Regular Expression	18
3	Grammars	13
4	Pushdown Stack Memory Machines	08
5	Turing Machine	03

Total Hours (Theory): 45

Total Hours (Lab): 00

Total Hours: 45

Detailed Syllabus:

1.	**Mathematical Terms and Theory**	**03 Hours**	**15 %**
	Alphabets, Strings, Languages, State, Graphs and Trees Concept of Basic machine. Finite State machine Concept of Moore and Mealy FSM, Conversion of Moore to Mealy and Mealy to Moore FSM. FSM with Epsilon moves Minimization of FSM.		
2.	**Regular Expression**	**18 Hours**	**36 %**
	Building RE. Conversion of DFA to RE and RE to DFA Properties of regular sets Decision algorithms for regular sets.		
3.	**Grammars**	**13 Hours**	**30 %**
	Ambiguous grammar, Removal of ambiguity Reduced form grammar - Removal of unit productions, Epsilon productions, Useless symbols, Chomsky hierarchy Context Free Grammars Regular Grammar -Left linear and right linear regular grammar, I Interconversion between left linear and right linear grammar Construction of regular grammar from DFA, Construction of FA from regular grammar Context Free Languages		
4.	**Pushdown Stack Memory Machines**	**08 Hours**	**15 %**
	Power of PDM Deterministic and Non-deterministic PDM Construction of PDA from CFG, Construction of CFG from PDA Production Systems		
5.	**Turing Machine**	**03 Hours**	**04 %**
	Power of TM over FSM PDM and PM Design of TM, Universal TM, TM limitations, Halting problem, Undecidability		

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 FmDFBJBz0zCsOF 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