

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical /Oral	Tutorial	Total
ITC404	Automata Theory	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme						
		Theory Marks				Term Work	Pract. /Oral	Total
		Internal assessment			End Sem. Exam			
		Test1	Test 2	Avg.				
ITC404	Automata Theory	20	20	20	80	--	--	100

Course Objectives:

Sr. No.	Course Objectives
	The course aims:
1	To learn fundamentals of Regular and Context Free Grammars and Languages.
2	To understand the relation between Regular Language and Finite Automata and machines.
3	To learn how to design Automata's as Acceptors, Verifiers and Translators.
4	To understand the relation between Regular Languages, Contexts free Languages, PDA and TM.
5	To learn how to design PDA as acceptor and TM as Calculators.
6	To learn applications of Automata Theory.

Course Outcomes:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
	On successful completion, of course, learner/student will be able to:	
1	Explain, analyze and design Regular languages, Expression and Grammars.	L2, L4, L6
2	Design different types of Finite Automata and Machines as Acceptor, Verifier and Translator.	L6
3	Analyze and design Context Free languages and Grammars.	L4, L6
4	Design different types of Push down Automata as Simple Parser.	L6
5	Design different types of Turing Machines as Acceptor, Verifier, Translator and Basic computing machine.	L6
6	Develop understanding of applications of various Automata.	L6

Prerequisite: Basic Mathematical Fundamentals: Sets, Logic, Relations, Functions.

DETAILED SYLLABUS:

Sr. No.	Module	Detailed Content	Hours	CO Mapping
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0	Prerequisite	Basic Mathematical Fundamentals: Sets, Logic, Relations, Functions.	02	-
I	Introduction and Regular Languages	Languages: Alphabets and Strings. Regular Languages: Regular Expressions, Regular Languages, Regular Grammars, RL and LL grammars, Closure properties Self-learning Topics: Practice exercise on Regular Expressions. Identify the tools also.	05	CO1
II	Finite Automata	Finite Automata: FA as language acceptor or verifier, NFA (with and without ϵ), DFA, RE to NFA, NFA to DFA, Reduced DFA , NFA-DFA equivalence, FA to RE. Finite State Machines with output : Moore and Mealy machines. Moore and Mealy M/C conversion. Limitations of FA. Self-learning Topics: Practice exercise on FA and NFA	09	CO2
III	Context Free Grammars	Context Free Languages: CFG, Leftmost and Rightmost derivations, Ambiguity, Simplification and Normalization (CNF & GNF) and Chomsky Hierarchy (Types 0 to 3) Self-learning Topics: Practice numerical or exercise on CFG	08	CO3
IV	Push Down Automata	Push Down Automata: Deterministic (single stack) PDA, Equivalence between PDA and CFG. Power and Limitations of PDA. Self-learning Topics: List the examples of PDA.	05	CO4
V	Turing Machine	Turing Machine: Deterministic TM, Variants of TM, Halting problem, Power of TM. Self-learning Topics: Practice numerical of TM.	07	CO5
VI	Applications of Automata	Applications of FA, CFG, PDA & TM. Introduction to Compiler & Its phases. Self-learning Topics: Case study on any one compiler.	03	CO2,CO 3, CO4,CO 5, CO6

Text books

1. J.C.Martin, "Introduction to languages and the Theory of Computation", TMH.
2. Kavi Mahesh, "Theory of Computation A Problem Solving Approach", Wiley India
3. A. V. Aho, R. Shethi, Monica Lam , J.D. Ulman , "Compilers Principles, Techniques and Tools", Pearson Education.

References

1. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, "Introduction to Automata Theory, Languages and Computation", Pearson Education.
2. Daniel I.A. Cohen, "Introduction to Computer Theory", John Wiley & Sons.
3. Vivek Kulkarni," Theory of Computation", Oxford University.
4. N.Chandrashekhar, K.L.P. Mishra, "Theory of Computer Science, Automata Languages & Computations", PHI publications.
- 5.J. J. Donovan, " Systems Programming", TMH.

Online References:

Sr. No.	Website Name
1.	https://www.nptel.ac.in
2.	https://online.stanford.edu
3.	https://www.coursera.org/

Assessment:

Internal Assessment (IA) for 20 marks:

- IA will consist of Two Compulsory Internal Assessment Tests. Approximately 40% to 50% of syllabus content must be covered in First IA Test and remaining 40% to 50% of syllabus content must be covered in Second IA Test

➤ Question paper format

- Question Paper will comprise of a total of **six questions each carrying 20 marks** **Q.1** will be **compulsory** and should **cover maximum contents of the syllabus**
- **Remaining questions** will be **mixed in nature** (part (a) and part (b) of each question must be from different modules. For example, if Q.2 has part (a) from Module 3 then part (b) must be from any other Module randomly selected from all the modules)
- A total of **four questions** need to be answered