

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.	<b>02</b>	-
I	Introduction and Regular Languages	Languages: Alphabets and Strings. Regular Languages: Regular Expressions, Regular Languages, Regular Grammars, RL and LL grammars, Closure properties <b>Self-learning Topics:</b> Practice exercise on Regular Expressions. Identify the tools also.	<b>05</b>	CO1
II	Finite Automata	Finite Automata: FA as language acceptor or verifier, NFA ( with and without $\epsilon$ ), 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. <b>Self-learning Topics:</b> Practice exercise on FA and NFA	<b>09</b>	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) <b>Self-learning Topics:</b> Practice numerical or exercise on CFG	<b>08</b>	CO3
IV	Push Down Automata	Push Down Automata: Deterministic (single stack) PDA, Equivalence between PDA and CFG. Power and Limitations of PDA. <b>Self-learning Topics:</b> List the examples of PDA.	<b>05</b>	CO4
V	Turing Machine	Turing Machine: Deterministic TM, Variants of TM, Halting problem, Power of TM. <b>Self-learning Topics:</b> Practice numerical of TM.	<b>07</b>	CO5
VI	Applications of Automata	Applications of FA, CFG, PDA & TM. Introduction to Compiler & Its phases.  <b>Self-learning Topics:</b> Case study on any one compiler.	<b>03</b>	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.	<a href="https://www.nptel.ac.in">https://www.nptel.ac.in</a>
2.	<a href="https://online.stanford.edu">https://online.stanford.edu</a>
3.	<a href="https://www.coursera.org/">https://www.coursera.org/</a>

#### 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