

AUTOMATA THEORY AND FORMAL LANGUAGES

Course code: 18IS4DCFLT

L: P: T: S: 3: 0: 0: 0

Exam Hours: 03

Total Hours: 40

Credits: 03

CIE Marks: 50

SEE Marks: 50

Course Objectives:

1. Understand basic properties of formal languages and formal grammars.
2. To present the theory of finite automata, as the first step towards learning advanced topics such as compiler design.
3. Understand basic properties of deterministic and nondeterministic finite automata and discussing the applications of finite automata towards text processing.
4. Understand the relation between types of languages and types of finite automata and to develop an understanding of computation through Turing Machines.

Course Outcomes: After completion of the course, the graduates will be able to

C01	Proficiency with mathematical tools & formal method.
C02	Acquire a fundamental understanding of core concepts relating to the theory of computation.
C03	Ability to understand the regular languages, its properties, equivalence and minimization of automata.
C04	Ability to solve problems on Deterministic finite automata and Non Deterministic machines.
C05	Ability to analyze and solve problems related to pushdown automata and Turing machines.
C06	Develop a view on the importance of computational theory.

Mapping of Course outcomes to Program outcomes:

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PS01	PS02	PS03
C01	3	2	2	-	-	-	-	-	-	-	-	-	3	-	-
C02	3	2	2	-	-	-	-	-	-	-	-	-	2	-	-
C03	3	2	2	-	-	-	-	-	-	-	-	-	3	-	-
C04	2	1	1	-	-	-	-	-	-	-	-	-	2	-	-
C05	3	2	2	-	-	-	-	-	-	-	-	-	3	-	-
C06	2	1	1	-	-	-	-	-	-	-	-	-	3	-	-

Unit	Course Content	Hours	Cos
1	AUTOMATA : THE METHODS AND THE MADNESS Introduction to Finite Automata; The central concepts of Automata theory; Deterministic finite automata; Nondeterministic finite automata, An application: Text search, Finite automata with Epsilon-transitions. REGULAR EXPRESSIONS AND LANGUAGES: Regular expressions; Finite Automata and Regular Expressions;	8	C01 C04
2	PROPERTIES OF REGULAR LANGUAGES: Proving languages not to be regular languages; Closure properties of regular languages; Decision properties of regular languages; Equivalence and minimization of automata.	8	C03
3	CONTEXT-FREE GRAMMARS AND LANGUAGES: Context –free grammars; Parse trees; PROPERTIES OF CONTEXT-FREE LANGUAGES: Normal forms for CFGs, The Pumping Lemma for CFLs, Closure properties of CFL.	8	C02
4	PUSHDOWN AUTOMATA: Definition of the Pushdown automata; the languages of a PDA; Equivalence of PDA's and CFG's; Deterministic Pushdown Automata	8	C05
5	INTRODUCTION TO TURING MACHINES: Problems that Computers cannot solve; The turning machine; Programming techniques for Turning Machines. UN-DECIDABILITY: A Language that is not recursively enumerable; Post's Correspondence problem.	8	C05 C06

Self study component:

Note:

1. Questions for CIE and SEE not to be set from self-study component.

2. Assignment Questions should be from self-study component only.

UNIT 1: Applications of Regular Expressions.

UNIT 3: Applications of Context –free grammars

UNIT5: Extensions to the basic Turing Machines, Turing Machine and Computers, an undecidable problem that is RE

TEXT BOOKS

1. John E. Hopcroft, Rajeev Motwani, Jeffrey D.Ullman: Introduction to Automata Theory, Languages and Computation, 3rd Edition, Pearson Education, 2007. (Chapters: 1.1, 1.5, 2.2 to 2.5, 3.1 to 3.3, 4, 5.1 to 5.3, 6, 7.1 to 7.3, 8.1 to 8.4, 8.6,

9.1, 9.2,9.4.1)

REFERENCE BOOKS

1. Elaine Rich: Automata, Computability and Complexity, 1st edition, Pearson Education, 2008.
2. Raymond Greenlaw, H. James Hoover: Fundamentals of the Theory of Computation, Principles and Practice, Elsevier, 1998.
3. John C Martin: Introduction to Languages and Automata Theory, 3rd Edition, Tata McGraw-Hill, 2007.
4. Thomas A. Sudkamp: An Introduction to the Theory of Computer Science, Languages and Machines, 3rd Edition, Pearson Education, 2006.
5. K.L.P. Mishra: Theory of Computer Science, Automata, Languages, and Computation, 3rd Edition, PHI Learning, 2009.

Assessment Pattern:

CIE –Continuous Internal Evaluation Theory (50 Marks)

Bloom's Category	Tests	Assignments	AAT1	AAT2
Marks (Out of 50)	30	10	05	05
Remember	--	--	02	01
Understand	10	--	01	01
Apply	10	05	--	01
Analyze	05	05	02	02
Evaluate	05			
Create				

*AAT 1– Alternate Assessment Tool 1: Quiz

AAT 2 - Alternate Assessment Tool 2: Surprise Test

SEE –Semester End Examination Theory (50 Marks)

Bloom's Category	Marks Theory(50)
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	