DHANALAKSHMI SRINIVASAN ENGINEERING COLLEGE
(AUTONOMOUS)
(Approved by AICTE & Affiliated to Anna University, Chennai)
Re-Accredited by NAAC with 'A' Grade
Accredited by NBA for AERO, BME, CSE, ECE, EEE, IT & MECH.
PERAMBALUR-621212, TAMILNADU, INDIA.
Website: www.dsengg.ac.in

COURSE PLAN (2025-2026 ODD SEM)

Name of the Faculty				
Designation/Department	AP/IT			
Course Code/Name	U23CBT51/THEORY OF COMPUTATION			
Year/Section/Department	III/-/IT			
Credits Details	L:3	T:0	P:0	C:3
Total Contact Hours Required	45			

Syllabus:

UNIT I AUTOMATA FUNDAMENTALS	**No. of Periods 9**
Introduction to formal proof – Additional forms of Proof – Inductive Proofs –Finite Automata – Deterministic Finite Automata – Non-deterministic Finite Automata – Finite Automata with Epsilon Transitions	
UNIT II REGULAR EXPRESSIONS AND LANGUAGES	**No. of Periods 9**
Regular Expressions – FA and Regular Expressions – Proving Languages not to be regular – ClosureProperties of Regular Languages – Equivalence and Minimization of Automata.	
UNIT III CONTEXT FREE GRAMMAR AND LANGUAGES	**No. of Periods 9**
CFG – Parse Trees – Ambiguity in Grammars and Languages – Definition of the Pushdown Automata– Languages of Pushdown Automata – Equivalence of Pushdown Automata and CFG, Deterministic Pushdown Automata.	
UNIT IV PROPERTIES OF CONTEXT FREE LANGUAGES	**No. of Periods 9**
Normal Forms for CFG – Pumping Lemma for CFL – Closure Properties of CFL – Turing Machines – Programming Techniques for TM.	
UNIT V UNDECIDABILITY	**No. of Periods 9**
Non Recursive Enumerable (RE) Language – Undecidable Problem with RE – Undecidable Problemsabout TM – Post's Correspondence Problem, The Class P and NP.	

Objective:

- ❖ To understand the language hierarchy.
- ❖ To construct automata for any given pattern and find its equivalent regular expressions
- ❖ To design a context free grammar for any given language.
- ❖ To understand Turing machines and their capability.
- ❖ To understand undecidable problems and NP class problems.

DSEC/IT/ U23CBT51/III/V

Text Book:

T1: Hopcroft, J.E. Motwani, R. and Ullman, J.D, "Introduction to Automata Theory, Languages and

Computations", 2nd Edition, Pearson Education, 2013.
T2: Introduction to the Theory of Computation" by Michael Sipser, 2015

Reference Book:

R1: H.R.Lewis and C.H.Papadimitriou, "Elements of the theory of Computation", Second Edition, PHI, 2003.
R2: J.Martin, "Introduction to Languages and the Theory of Computation", Third Edition, TMH, 2008.

Website:

W1:https://www.slideshare.net/mobile/mukeshnt/finite-automata-presentation
W2:https://www.tutorialspoint.com/automata_theory/deterministic_finite_automaton.htm
W3: https://www.educative.io/answers/what-are-the-closure-properties-of-regular-languages
W4: https://www.javatpoint.com/pushdown-automata
W5: https://www.geeksforgeeks.org/recursive-and-recursive-enumerable-languages-in-toc

Online Mode of Study (if Any):

- https://onlinecourses.nptel.ac.in/noc21_cs83

Course Plan:

Topic Number	Topic	Reference Detail	Page Number	Mode of teaching	Number of Periods Required	Cumulative Period
UNIT I	**AUTOMATA FUNDAMENTALS**					
1	Introduction to formalproof	T1	5-13	BB	1	1
2	Additional forms of Proof	T1	13-19	BB	1	2
3	Inductive Proofs	T1	19-26	BB	1	3
4	Finite Automata	W1	-	-	1	4
5	Finite Automata	W1	-	-	1	5
6	Deterministic Finite Automata	W2	-	-	1	6
7	Non-deterministic Finite Automata	T1	55-66	BB	1	7
8	Finite Automata withEpsilon	T1	72-76	BB	1	8

	Transitions					
9	Finite Automata withEpsilon Transitions	T1	76-80	BB	1	9
Outcome of Unit I: CO1: Illustrate automata and Epsilon Transitions.						
UNIT II	**REGULAR EXPRESSIONS AND LANGUAGES**					
10	Regular Expressions	T1	83-89	BB	2	10,11

11	FA and Regular Expressions	T1	90-106	BB	2	12
12	Proving Languages not to be regular	T1	125-127	BB	2	13, 14
13	Closure Properties ofRegular Languages	W3	-	-	1	15
14	Equivalence and Minimization of Automata.	T1	154-162	BB	1	16,17
		T1	162-165	PPT	1	18
Outcome of Unit II: CO2: State regular expression of string pattern.						
UNIT III CONTEXT FREE GRAMMAR AND LANGUAGES						
15	CFG	T1	169-179	BB	1	19
16	Parse Trees	T1	181-191	BB	1	20,21
17	Ambiguity in Grammars and Languages	T1, R2	205-216, 134-148	BB	1	22,23
18	Definition of the Pushdown Automata	W4	-	-	1	24
19	Languages of a Pushdown Automata	T1	229-236	BB	1	25
20	Equivalence of Pushdown Automataand CFG	T1	237-245	PPT	2	26
21	Deterministic Pushdown Automata	T1	246-249	BB	2	27
Outcome of Unit III CO3: Learn context free grammar for any language.						
UNIT IV PROPERTIES OF CONTEXT FREE LANGUAGES						
22	Normal Forms for CFG	T1	255-258	BB	2	28
23	Pumping Lemma for CFL	T1	274-280	BB	1	29,30
24	Closure Properties of CFL	T1	281-285	BB	1	31

25	Turing Machines	T1,R3	316-320, 124-146	BB	1	32,33
26	Programming Techniques for TM.	T1	329-331	BB	2	34,35
27	Programming Techniques for TM.	T1	332-335	BB	2	36
Outcome of Unit IV: CO4: Understand Turing machine to propose computation solutions.						
UNIT V UNDECIDABILITY						
28	Non Recursive Enumerable(RE) Language	W5	-	-	2	37,38
29	Undecidable	T1	367-	BB	2	39,40

30	Problemwith RE Undecidable Problems about TM	T1	370 373-382	BB	2	41,42
31	Post's Correspondence Problem	T1	392-403	PPT	2	43,44
32	The Class P and NP.	T1	413-419	BB	1	45

Outcome of Unit V:

CO5: Interpret whether a problem is decidable or not.
CO6: Explain NP class problems.

Course Outcome:

At the end of course:
Students should be able to do:
CO1. Illustrate automata and Epsilon Transitions.
CO2. State regular expression of string pattern.
CO3. Learn context free grammar for any language.
CO4. Understand Turing machine to propose computation solutions.
CO5. Interpret whether a problem is decidable or not.
CO6. Explain NP class problems.

Course Outcome Vs Program Outcome Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	2	-	-	-	-	1	2	-	-	-	-
CO2	2	1	2	2	-	-	-	-	1	1	-	-	-	1
CO3	3	2	3	1	-	-	-	-	1	2	-	-	-	1
CO4	3	2	2	1	-	-	-	-	1	2	-	-	-	1
CO5	2	1	2	2	-	-	-	-	1	2	-	-	-	-
CO6	2	1	2	2	-	-	-	-	-	1	-	-	-	1
AVG	2.5	1.5	2	1.7	-	-	-	-	1	1.7	-	-	-	1

Content beyond Syllabus:

❖ Real World Applications of Automaton Theory

Internal Evaluation Components

Web portal Assignment		Components	Topic Number with Topic / Unit Details	Relevance to CO
	--	**Assessment – I (60)**	**Unit I and II**	**CO 1 & CO2**
Web portal 1	**1**	**Assignment – Handwritten (20)**	1. Inductive Proofs and Finite Automata 2. Finite Automata withEpsilon Transitions 3. Inductive Proofs and Finite Automata	**CO 1 & CO2**

			4. Finite Automata withEpsilon Transitions	
	2	Assignment – Poster Presentation / PPT (20)	1. FA and Regular Expressions. 2. Closure Properties of Regular Languages 3. Equivalence and Minimization of Automata	CO 1 & CO2
Web portal 2	--	Assessment – II (60)	Unit III and IV	CO3 & CO4
	3	Seminar (20)	1. Equivalence of Pushdown Automata and CFG 2. Regular Expressions	CO3 & CO4
	4	Case Study Report (20)	1. Closure Properties ofCFL 2. Undecidable Problems about TM	CO3 & CO4
Web portal 3	--	Model Exam (75)	Unit I to V	CO1 to CO6
	5	MCQ (15)	Unit I to V	CO1 to CO6
	-	Course Attendance (10)	--	--

Submission Details:

Phase 1(Before AT 1)		Phase 2 (Before AT 2)		Phase 3 (Before AT 3)
Assignment 1	Assignment 2	Assignment 3	Assignment 4	Assignment 5

PLAN OF ASSESSMENT TEST –DISTRIBUTION OF MARKS:

TEST	CO- MARK WISE DISTRIBUTION						BLOOM'S LEVEL MARK WISE DISTRIBUTION					
AT-1	CO1	CO2	CO3	CO4	CO5	CO6	BTL1	BTL2	BTL3	BTL4	BTL5	BTL6
	37	23	--	--	--	--	12	30	18	--	--	--
AT-2	CO1	CO2	CO3	CO4	CO5	CO6	BTL1	BTL2	BTL3	BTL4	BTL5	BTL6
	--	--	37	23	--	--	10	35	15	--	--	--
MODEL	CO1	CO2	CO3	CO4	CO5	CO6	BTL1	BTL2	BTL3	BTL4	BTL5	BTL6
	20	20	20	10	10	--	28	40	32	--	--	--

Google Class Code Details: al6r7lxm

Prepared By **Verified By**

AP/IT **HOD/IT**

Approved By

PRINCIPAL