DHANALAKSHMI SRINIVASAN ENGINEERING COLLEGE
(AUTONOMOUS)
(Approved by AICTE & Affiliated to Anna University, Chennai)
Accredited with 'A' Grade by NAAC, Accredited by TCS
Accredited by NBA with BME, ECE & EEE
PERAMBALUR - 621 212. Tamil Nadu.
website : www.dsengg.ac.in

COURSE PLAN (2024-2025 ODD SEM)

Name of the Faculty	Ms.K.LALITHAVANI			
Designation/Department	AP/IT			
Course Code/Name	U23ITV11/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 EpsilonTransitions	
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, DeterministicPushdown 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.

Text Book:

T1: J.E.Hopcroft, R.Motwani and J.D Ullman, "Introduction to Automata Theory, Languages and Computations", Second Edition, Pearson Education, 2003.

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, 2003.
R3: Micheal Sipser, "Introduction of the Theory and Computation", Thomson Brokecole, 1997.

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	ReferenceDetail	Page Number	Mode of teaching	Number of Periods Required	CumulativePeriod
UNIT I	**AUTOMATA FUNDAMENTALS**					
1	Introduction to formalproof	T1	5-13	BB	1	1
2	Additional forms ofProof	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 Finit eAutomata	W2	-	-	1	6

7	Non-deterministic Finite Automata	T1	55-66	BB	1	8
8	Finite Automata withEpsilon Transitions	T1	72-76	BB	1	10
9	Finite Automata withEpsilon Transitions	T1	76-80	BB	1	12
Outcome of Unit I: CO1: Construct automata and Epsilon Transitions.						
UNIT II	**REGULAR EXPRESSIONS AND LANGUAGES**					
10	Regular Expressions	T1	83-89	BB	2	14
11	FA and Regular Expressions	T1	90-106	BB	2	16
12	Proving Languages not to be regular	T1	125-127	BB	2	18
13	Closure Properties ofRegular Languages	W3	-	-	1	20
14	Equivalence and Minimization of Automata.	T1	154-162	BB	1	22
		T1	162-165	BB	1	24
Outcome of Unit II: CO2: Outline regular expression of string pattern.						
UNIT III	**CONTEXT FREE GRAMMAR AND LANGUAGES**					
15	CFG	T1	169-179	BB	1	25
16	Parse Trees	T1	181-191	BB	1	26
17	Ambiguity in Grammars and Languages	T1, R2	205-216, 134-148	BB	1	28
18	Definition of the Pushdown Automata	W4	-	-	1	30
19	Languages of a Pushdown Automata	T1	229-236	BB	1	32
20	Equivalence of Pushdown Automataand CFG	T1	237-245	BB	2	34
21	Deterministic Pushdown Automata	T1	246-249	BB	2	36
Outcome of Unit III CO3: Apply context free grammar for any language.						

UNIT IV	**PROPERTIES OF CONTEXT FREE LANGUAGES**					
22	Normal Forms for CFG	T1	255-258	BB	2	38
23	Pumping Lemma for CFL	T1	274-280	BB	1	40
24	Closure Properties ofCFL	T1	281-285	BB	1	42
25	Turing Machines	T1,R3	316-320, 124-146	BB	1	44
26	Programming Techniques for TM.	T1	329-331	BB	2	46
27	Programming Techniques for TM.	T1	332-335	BB	2	48
Outcome of Unit IV: CO4: Apply Turing machine to propose computation solutions.						
UNIT V	**UNDECIDABILITY**					
28	Non Recursive Enumerable(RE) Language	W5	-	-	2	50
29	Undecidable Problemwith RE	T1	367-370	BB	2	52
30	Undecidable Problems about TM	T1	373-382	BB	2	54
31	Post's Correspondence Problem	T1	392-403	BB	2	57
32	The Class P and NP.	T1	413-419	BB	1	60
Outcome of Unit V: CO5: Interpret whether a problem is decidable or not. CO6: Interpret NP class problems.						

Course Outcome:

At the end of course:
Students should be able to do:
CO1. Construct automata and Epsilon Transitions.
CO2. Outline regular expression of string pattern.
CO3. Apply context free grammar for any language.
CO4. Apply Turing machine to propose computation solutions.
CO5. Interpret whether a problem is decidable or not.
CO6. Interpret 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	-	-	-	-	-	2	-	-	-	-
CO2	2	1	2	2	-	-	-	-	-	1	-	-	-	-
CO3	3	2	3	1	-	-	-	-	-	2	-	-	-	1
CO4	3	2	2	1	-	-	-	-	-	2	-	-	-	1
CO5	2	1	2	2	-	-	-	-	-	2	-	-	-	-
CO6	2	1	2	2	-	-	-	-	-	1	-	-	-	-
AVG	2.5	1.5	2	1.67	-	-	-	-	-	1.67	-	-	-	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
Web portal 1	--	Assessment – I (60)	Unit I and II	CO 1 & CO2
	1	Assignment – Handwritten (20)	1. Inductive Proofs and Finite Automata 2. Finite Automata withEpsilon Transitions 3. Inductive Proofs and Finite Automata 4. Finite Automata withEpsilon Transitions	CO 1 & CO2

	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**
20.8.2024	29.08.2024	15.10.2024	22.10.2024	03.12.2024

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**	**--**	**--**	**--**	**--**	**10**	**34**	**16**	**--**	**--**	**--**
AT-2	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**	**CO6**	**BTL1**	**BTL2**	**BTL3**	**BTL4**	**BTL5**	**BTL6**
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MODEL	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**	**CO6**	**BTL1**	**BTL2**	**BTL3**	**BTL4**	**BTL5**	**BTL6**
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Google Class Code Details: jhqkubx

Prepared By

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PRINCIPAL