MOHAMMED SATHAK A J COLLEGE OF ENGINEERING

Siruseri IT park, OMR, Chennai - 603103

LESSON PLAN

Department of Computer Science & Engineering

Name of the	Theory of Computation		Name of the	Mrs. KANMANI M
Subject Code	CS3452		Year / Sem	II/IV
Acad Year	2022-2023		Batch	2020-2024

Course Objective

1. To understand foundations of computation including automata theory
2. To construct models of regular expressions and languages
3. To design context free grammar and push down automata
4. To understand Turing machines and their capability
5. To understand undecidable problems and NP class problems

Course Outcome

Upon completion of the course, the students will be able to:
1. Construct automata theory using Finite Automata
2. Write regular expressions for any pattern
3. Design context free grammar and Pushdown Automata
4. Design Turing machine for computational functions
5. Differentiate between decidable and undecidable problems

Sl. No.	Topic(s)	T / R* Book	Periods Required	Mode of Teaching (BB / PPT / NPTEL / MOOC /	Blooms Level (L1-L6)	CO	PO
UNIT-I	**AUTOMATA AND REGULAR EXPRESSIONS**						
1	Need for automata theory	T1	1	PPT	L1	CO1	PO3
2	Introduction to formal proof	T1	1	BB	L2	CO1	PO1
3	Finite Automata (FA)	T1	1	BB	L1	CO1	PO5
4	Deterministic Finite Automata (DFA)	T1	1	BB	L3	CO1	PO5
5	Non-deterministic Finite Automata (NFA)	T1	1	BB	L1	CO1	PO1
6	Equivalence between NFA and DFA	T1	1	BB	L3	CO1	PO5
7	Finite Automata with Epsilon transitions	T1	2	BB	L4	CO1	PO1
8	Minimization of DFAs.	T2	2	BB	L1	CO2	PO1

Suggested Activity: Assignment / Case Studies / Tutorials/ Quiz / Mini Projects / Model Developed/others Planned if any: Quiz
Evaluation method

UNIT II	**REGULAR EXPRESSIONS AND LANGUAGES**						
9	Regular Expressions	T1	1	BB	L2	CO2	PO5
10	Regular Languages	T2	2	PPT	L2	CO2	PO5
11	Equivalence of Finite Automata and regular expressions	T2	2	PPT	L3	CO2	PO1
12	Proving languages to be not regular (Pumping Lemma)	T1	2	BB	L3	CO2	PO5
13	Closure properties of regular languages	T2	2	PPT	L1	CO2	PO5
		T2	2	BB	L3	CO2	PO5

Suggested Activity: Assignment / Case Studies / Tutorials/ Quiz / Mini Projects / Model Developed/others Planned if any: Quiz
Evaluation method

UNIT III	**CONTEXT FREE GRAMMAR AND PUSH DOWN AUTOMATA**						
14	Types of Grammar	T1	1	BB	L1	CO3	PO5
15	Chomsky's hierarchy of languages	T1	2	PPT	L3	CO3	PO1
16	Context-Free Grammar (CFG) and Languages	T1	2	BB	L2	CO3	PO5
17	Ambiguity in grammars and languages	T1	2	PPT	L3	CO3	PO5
18	Instantaneous descriptions -Languages of pushdown automata	T1	2	BB	L2	CO3	PO1
19	Equivalence of pushdown automata and CFG-CFG to PDA-PDA to CFG	T1	2	BB	L2	CO3	PO5
20	Deterministic Pushdown Automata						

Suggested Activity: Assignment / Case Studies / Tutorials/ Quiz / Mini Projects / Model Developed/others Planned if any: Assignment
Evaluation method

UNIT IV	**NORMAL FORMS AND TURING MACHINES**						
21	Normal Forms for CFG	T2	1	BB	L1	CO4	PO3
22	Pumping Lemma for CFL	T2	2	BB	L2	CO4	PO1
23	Closure Properties of CFL	T2	2	BB	L2	CO4	PO1
24	Turing Machines	T2	2	BB	L3	CO4	PO3
25	Programming Techniques for TM	T2	2	BB	L2	CO4	PO1

Suggested Activity: Assignment / Case Studies / Tutorials/ Quiz / Mini Projects / Model Developed/others Planned if any: Assignment
Evaluation method

UNIT V	**UNDECIDABILITY**						
26	Unsolvable Problems and Computable Functions	T2	1	PPT	L3	CO5	PO1
27	PCP-MPCP	T2	2	BB	L3	CO5	PO3
28	Recursive and recursively enumerable languages	T2	2	BB	L3	CO5	PO1
29	Tractable and intractable problems	T2	2	BB	L2	CO5	PO5
30	P and NP completeness – Kruskal's algorithm	T2	2	BB	L2	CO5	PO5
31	Travelling Salesman Problem-	T3	2	BB	L3	CO5	PO5
32	3-CNF SAT problems	T3	2	BB	L3	CO5	PO5

Suggested Activity: Assignment / Case Studies / Tutorials/ Quiz / Mini Projects / Model Developed/others Planned if any:Quiz
Evaluation method

Content Beyond the Syllabus Planned

1. 1.Discuss in detail about DFA & NDFA

Text Books

1. Hopcroft J.E., Motwani R. & Ullman J.D., "Introduction to Automata Theory, Languages and Computations", 3rd Edition, Pearson Education, 2008.
2. John C Martin , "Introduction to Languages and the Theory of Computation", 4th Edition, Tata McGraw Hill, 2011.

Reference Books

1. Harry R Lewis and Christos H Papadimitriou , "Elements of the Theory of Computation", 2nd Edition, Prentice Hall of India, 2015
2. Peter Linz, "An Introduction to Formal Language and Automata", 6th Edition, Jones & Bartlett, 2016.
3. K.L.P.Mishra and N.Chandrasekaran, "Theory of Computer Science: Automata Languages and Computation", 3rd Edition, Prentice Hall of India, 2006.
5. http://nptel.ac.in/

Website / URL References

1. https://www.tutorialspoint.com
2.

Blooms Level

Level 1 (L1) : Remembering	Lower Order Thinking	Level 4 (L4) : Analysing	Higher Order Thinking	Projects / Mini Projects
Level 2 (L2) : Understanding		Level 5 (L5) : Evaluating		
Level 3 (L3) : Applying		Level 6 (L6) : Creating		

Fixed Hour Exams

Mapping syllabus with Bloom's Taxonomy LOT and HOT

Unit No	Unit Name	L1	L2	L3	L4	L5	L6	LOT	HOT	Total
Unit 1	AUTOMATA FUNDAMENTALS	5	1	3	0	0	0	9	0	9
Unit 2	REGULAR EXPRESSIONS AND LANGUAGES	2	3	4	0	0	0	9	0	9
Unit 3	CONTEXT FREE GRAMMAR AND LANGUAGES	1	4	4	0	0	0	9	0	9
Unit 4	PROPERTIES OF CONTEXT FREE LANGUAGES	1	6	2	0	0	0	9	0	9
Unit 5	UNDECIDABILITY	0	5	4	0	0	0	9	0	9
	Total	9	19	17	0	0	0	45	0	45
	Total Percentage	20	42.2	37.8	0	0	0	100	0	100

CO PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	0	2	0	0	0	0	0	0	0	3	2
CO2	3	3	3	0	2	0	0	0	0	0	0	0	3	2
CO3	3	3	3	0	2	0	0	0	0	0	0	0	3	2
CO4	3	3	3	0	2	0	0	0	0	0	0	0	3	2
CO5	3	3	3	0	2	0	0	0	0	0	0	0	3	2
Avg														

Justification for CO-PO mapping

CO1	Students get the ability to know the regular expression
CO2	Students able to apply the Context free grammar
CO3	Students able to understand the concepts of Turing machines
CO4	Students can analyze of computation solutions using Turing machines
CO5	Students able to understand the basic concept of problem is decidable or not.

3	High level	**2**	Moderate level	**1**	Low level

Name & Sign of Subject Expert : KANMANI M
Head of the Department :CSE