

SEMESTER IV

U21CS402	THEORY OF COMPUTATION	Category: ESC				
		L	T	P	J	C
		3	0	0	0	3

PRE-REQUISITES:

- U21MAG02: Discrete Mathematics

COURSE OBJECTIVES:

- To study the concept of finite automata with its types and construction
- To understand the context free grammar for any given language
- To learn Turing machines, decidable and undecidable problems

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Construct finite automata for a given language with its types (Understand)

CO2: Prove the equivalence of languages described by finite automata and regular expressions (Apply)

CO3: Construct CFG for a given language, simplify and transform to a normal form (Understand)

CO4: Design Push Down Automata, convert into CFG and vice-versa (Apply)

CO5: Construct Turing machine and prove the undecidability or complexity of a variety of problems (Understand)

CO-PO MAPPING:

POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	-	-	-	-	-	2	-	2	2	-
CO2	2	1	-	1	-	-	-	-	-	2	-	1	2	-
CO3	3	2	2	1	-	-	-	-	-	2	-	1	-	-
CO4	3	2	2	1	-	-	-	-	-	2	-	2	-	-
CO5	3	2	2	2	-	-	-	-	-	2	-	2	-	-
CO	3	2	2	1	-	-	-	-	-	2	-	2	2	-

Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

SYLLABUS:

UNIT I FUNDAMENTALS OF FINITE AUTOMATA

9

Introduction – Finite State Systems – Finite Automata – Deterministic Finite Automata (DFA) – Non-deterministic Finite Automata (NFA) – Finite Automata with Epsilon Transitions – Equivalence of NFA and DFA – Equivalence of NFAs with and without Epsilon moves

UNIT II REGULAR EXPRESSIONS AND LANGUAGES

9

Regular Expressions – Equivalence of Finite Automata and Regular Expressions – Pumping lemma for regular sets – Closure properties of regular languages – Equivalence and minimization of automata

Dr. P. YUVARAJ, M.E, Ph.D.
Head of the Department

Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Coimbatore - 641 407

UNIT III GRAMMARS

9

Introduction to Grammar – Types of grammar – Context Free Grammars (CFGs) and Languages (CFLs) – Derivations and languages – Ambiguity – Relationship between derivation and derivation trees – Simplification of CFG – Elimination of useless symbols – Unit productions – Null productions – Normal forms – Greibach Normal Form (GNF) – Chomsky Normal Form (CNF)

UNIT IV PUSHDOWN AUTOMATA

9

Pushdown Automata – Definitions – Moves – Instantaneous descriptions – Deterministic pushdown automata – Equivalence of Pushdown automata and CFL – Pumping lemma for CFL – Closure properties of CFL

UNIT V TUBING MACHINE AND UNDECIDABILITY

g

Turing Machines (TM) – Programming Techniques for TM – Non Recursive Enumerable (RE) Language – Undecidable Problem with RE – Undecidable Problems about TM – Post's Correspondence Problem – The Class P and NP

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Project: – Periods
Total 45 Periods

TEXT BOOKS:

1. J.E.Hopcroft, R.Motwani and J.D Ullman, "Introduction to Automata Theory, Languages and Computations", 6th Edition, Pearson Education, 2016.
 2. John C Martin, "Introduction to Languages and the Theory of Computation", 3rd Edition, Tata McGraw Hill, 2013.

REFERENCES:

1. H.R.Lewis and C.H.Papadimitriou, "Elements of the theory of Computation", 2nd Edition, Prentice Hall of India, 2010
 2. Peter Linz, "An Introduction to Formal Language and Automata", 3rd edition, Narosa Publishers, 2011
 3. Micheal Sipser, "Introduction to Theory of Computation", 3rd Edition, Cengage Publishers, 2014

EVALUATION PATTERN:

Continuous Internal Assessments					End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		Total Internal Assessments	
*Individual Assignment / Case Study / Seminar / Mini Project / MCQ	Written Test	*Individual Assignment / Case Study / Seminar / Mini Project / MCQ	Written Test		
40	60	40	60	200	100
Total				40	60
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course Coordinator can choose any one / two components based on the nature of the course.

Dr. N.YUVARAJ M.E.,Ph.D.,
Head of the Department
Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Coimbatore - 641 407