22CST53 - THEORY OF COMPUTATION							
Programme & Branch	**B.E. – Computer Science and Engineering**	**Sem.**	**Category**	**L**	**T**	**P**	**Credit**
Prerequisites	**NIL**	**5**	**PC**	**3**	**1**	**0**	**4**

Preamble	The course helps the learners to know the models of computation, along with their variants in the context of formal languages and their recognizers and to familiarize students with the foundations and principles of computer science. This can be applied in designing compilers and pattern recognition system.

Unit – I	**Formal proof and Automata**	**9+3**

Introduction to formal proof – Finite Automata (FA) – Deterministic Finite Automata (DFA) – Non-deterministic Finite Automata (NFA) – Equivalence between NFA and DFA – Finite Automata with Epsilon transitions – Conversion of NFA into DFA – Equivalence and minimization of automata.

Unit – II	**Regular Expressions and properties of regular languages**	**9+3**

Regular expression – Equivalence of finite automata and regular expressions – Proving languages not to be regular (Pumping Lemma) – Closure properties of regular languages.

Unit – III	**Context Free Grammars and Push Down Automata(PDA)**	**9+3**

Context-Free Grammar (CFG) – Parse trees – Ambiguity in grammars and languages. PushDown Automata – Definition of the pushdown automata (PDA) – Languages of PDA – Equivalence of PDA and CFG – Deterministic Pushdown Automata.

Unit – IV	**Context Free Languages and Turing Machines**	**9+3**

Normal forms for CFG – Chomsky Normal Form and Greibach Normal Form – Pumping lemma for CFL – Closure properties of CFL – Turing machines: Basic model – definition and representation – Instantaneous Description –Transition diagram for TM – Language acceptance by TM – TM as Computer of Integer functions – Programming techniques for Turing machines (subroutines).

Unit – V	**Undecidability**	**9+3**

language that is not Recursively Enumerable (RE) – An undecidable problem that is RE –Undecidable problems about Turing machine – Post's correspondence problem – The classes P and NP –Kruskal's algorithm – Traveling Salesman Problem.

Lecture:45, Tutorial:15, Total:60

TEXT BOOK:

1. Hopcroft J.E., Motwani R. & Ullman J.D., "Introduction to Automata Theory, Languages and Computation", 3rd Edition, Pearson Education, New Delhi, 2011.

REFERENCES:

1. Martin J., "Introduction to Languages and the Theory of Computation", 4th Edition, Tata McGraw-Hill, New Delhi, 2010.
2. Linz P., "Introduction to Formal Language and Computation", 4th Edition, Narosa Publishing, 2007.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	design finite automata for the regular languages	Applying(K3)
CO2	construct regular expression for the regular languages	Applying(K3)
CO3	demonstrate the recognition of context free languages using push down automata	Applying(K3)
CO4	construct Turing Machine to accomplish specific task and argue formally about its correctness	Applying(K3)
CO5	make use of Turing machines to distinguish decidable / undecidable problems	Applying(K3)

Mapping of COs with POs and PSOs

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

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	**Remembering (K1) %**	**Understanding (K2) %**	**Applying (K3) %**	**Analyzing (K4) %**	**Evaluating (K5) %**	**Creating (K6) %**	**Total %**
CAT1	-	30	70				100
CAT2	-	30	70				100
CAT3	-	40	60				100
ESE	-	25	75				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)