Semester: V						
THEORY OF COMPUTATION **Category: PROFESSIONAL CORE COURSE** **(Theory)** (Common to CS, CD, CY & IS)						
Course Code	:	**CS354TA**		**CIE**	:	**100 Marks**
Credits: L:T:P	:	**3:1:0**		**SEE**	:	**100 Marks**
Total Hours	:	**45L + 30T**		**SEE Duration**	:	**3 Hours**

Unit-I	**09 Hrs**
Regular Languages and Regular Expressions, Memory Required to Recognize a Language, Deterministic Finite Automata (DFA), Non Deterministic Finite Automata (NFA), Non Deterministic Finite Automata with ϵ -transitions (NFA-ϵ), Equivalence, Regular Expressions and Finite Automata, Applications of Regular Expressions, Algebraic laws of Regular Expressions, Minimization of Finite Automata.	
Unit – II	**09 Hrs**
Pumping Lemma for Regular Languages, Closure properties of Regular Languages, Decision properties of Regular languages. Context-free grammars (CFG), Parse trees, Applications, Ambiguity in grammars & languages, Simplification of CFG, Normal forms of CFGs. Regular Grammars, Equivalence of Regular Grammars and Finite Automata.	
Unit –III	**09 Hrs**
Push Down Automata (PDA): Definition, the languages of a PDA, Equivalence of PDA's & CFG's, Deterministic PDA. The Pumping Lemma for Context Free Languages (CFL), Closure properties of CFLs, Decision properties of CFLs	
Unit –IV	**09 Hrs**
Context Sensitive Languages (CSL) and Linear Bounded Automata (LBA), Turing Machines (TM): Definitions and Examples, TM as a Language Accepter, Computing Partial Functions with Turing Machine, Variations of Turing Machines, Combining Turing Machines, Non Deterministic TM, Universal TM.	
Unit –V	**09 Hrs**
Recursively Enumerable Languages (REL) and Recursive Languages. Properties of REL and Recursive Languages. More General Grammars: Context Sensitive Grammar and Unrestricted Grammar, Chomsky Hierarchy, Not all languages are Recursively Enumerable, Unsolvable Problem, Reducing One problem to another, The halting problem of TM, Post's Correspondence Problem (PCP), Time and Space Complexity of TM.	

Course Outcomes: After completing the course, the students will be able to: -	
CO 1	Understand the fundamental concepts of theory of computations.
CO 2	Analyze the tools of finite automata to various fields of computer science.
CO 3	Design solution model for complex problems, using the appropriate skills of automata theory for better results.
CO 4	Apply automata skills in situations that describe computation effectively and efficiently.

Reference Books	
1.	Introduction to Languages & Theory of Computation, John C Martin, Tata McGraw-Hill, 4th Edition, 2011 ISBN: 978-0-07-319146-1.
2.	Introduction to Automata Theory, Languages & Computation, J.P.Hopcroft, Rajeev Motwani, J.D.Ullman, Pearson Education., 3rd Edition, 2008,ISBN:81-3172-047-0.
3.	An Introduction To Formal Languages & Automata, Peter Linz, Narosa Publishing House, 6th Edition, 2007, ISBN: 07-6371-422-4.

RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY)		
#	**COMPONENTS**	**MARKS**
1.	**QUIZZES:** Quizzes will be conducted in online/offline mode. TWO QUIZZES will be conducted & Each Quiz will be evaluated for 10 Marks. **THE SUM OF TWO QUIZZES WILL BE THE FINAL QUIZ MARKS.**	**20**
2.	**TESTS:** Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). TWO tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 Marks. **FINAL TEST MARKS WILL BE REDUCED TO 40 MARKS**	**40**
3.	**EXPERIENTIAL LEARNING:** Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning (10), Program specific requirements (10), Video based seminar/presentation/demonstration (20) **Phase 2 will be done in the exhibition mode (Demo/Prototype/any outcome). ADDING UPTO 40 MARKS.**	**40**
	MAXIMUM MARKS FOR THE CIE THEORY	**100**