3IT06: THEORY OF COMPUTATION
CREDITS – 4(LTP: 3,1,0)

Course Objective:
To introduce mathematical foundations of computation including automata theory, the theory of formal languages and regular-non regular grammars.

Teaching and Assessment Scheme:

Teaching Scheme (Hours per Week)			Credits	Assessment Scheme				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	CE	ESE	CE	
3	1	0	4	60	40	-	-	100

Course Contents:

Unit No.	Topics	Teaching Hours
1	**Mathematical notations and techniques:** Introduction to sets, Set theory, Logic,Functions, Relations and Language definitions, The principle of mathematical inductions and recursive definitions.	8
2	**Graphs:** Basic terminology related to graphs, Multigraph and weighted graphs, Paths and circuits, Shortest path in weighted graphs, Eulerian path and circuits, Hamiltonian path and circuits.	3
3	**Regular Expression and Finite Automata:** Regular languages and regular expressions, Definition of finite automata, Introduction to deterministic and non-deterministic finite automata, Transformation of NFA to DFA, Equivalence of NFA and DFA, NFA with € transition, Conversion of NFA with € transitions to DFA, Minimization of DFA.	8
4	**Context free grammar:** Definition and examples, Context- free grammars, Parse tree, Ambiguity in grammar, Regular grammar.	8
5	**Pushdown Automata and context free language:** Introduction, Definition of pushdown automata, Deterministic pushdown automata, Construction of PDA equivalent to context free grammar, Construction of co equivalent to a PDA, Concept of context free language.	9
6	**Turing Machines and their languages:** Definition and examples, Transition diagram, Turing machine with Computing functions, Non Deterministic Turing machine, Universal Turing machine, Variation of Turing machine, Context sensitive languages.	9
	Total	**45**

List of References:

1. John C. Martin, *"Introduction to Languages and Theory of Computation",*Third Edition, Tata McGraw Hill.
2. C. L. Liu, "Elements of Discrete Mathematics", Second Edition, Tata McGraw Hill.
3. A.V. Aho, Ravi Sethi, J. D. Ullman, *"Compiler tools Techniques",* Second Edition,Addison Wesley publication.
4. John E. Hopcroft, Rajeev Motwani, Jeffrey D Ullman, *"Introduction to Automata Theory,*

Languages and Computation", Second Edition, Pearson Education.
5. Adesh K. Pandey, *"An introduction to automata theory and formal languages",* S. K. Kataria & Sons.
6. Michael Sipser, *"Introduction to Theory of Computation"*, Third Edition, Thomson Brooks/Cole.

Course Outcomes (COs):

At the end of this course students will be able to …

1. Understand concepts and application of set theory and function.
2. Understand concepts of mathematical proof used in designing any theorem.
3. Employ finite state machines and the equivalent regular expressions.
4. Classify machines by their power to recognize language.
5. Design pushdown automata for recognizable languages.
6. Design Turing machine for recognizable languages.