MCA401 AUTOMATA THEORY AND COMPUTABILITY

L	T	P	Cr
3	1	0	3.5

Course Objective: This course introduces basic theory of computer science and formal methods of computation. The course exposes students to the computability theory, as well as to the complexity theory.

Regular Languages: Alphabets, Language, Regular Expression, Definitions of Finite State Machine, Transition Graphs, Deterministic & Non-deterministic Finite State Machines, Regular Grammar, Thompson's Construction to Convert Regular Expression to NDFA & Subset Algorithm to convert NDFA to DFA, Various recent development in the Conversion of Regular Expression to NFA, Minimization of DFA, Finite State Machine with output- Moore machine and Melay Machine, Conversion of Moore machine to Melay Machine & Vice-Versa.

Properties of Regular languages: Conversion of DFA to Regular Expression, Pumping Lemma, Properties and Limitations of Finite state machine, Decision properties of Regular Languages, Application of Finite Automata.

Context Free Grammar and Push Down Automata : Context Free Grammar,Derivation tree and Ambiguity, Application of Context free Grammars, Chomsky and Greibach Normal form, Properties of context free grammar, CKY Algorithm, Decidable properties of Context free Grammar, Pumping Lemma for Context free grammar, Push down Stack Machine, Design of Deterministic and Non-deterministic Push-down stack.

Turing Machine: Turing machine definition and design of Turing Machine, Church-Turing Thesis, Variations of Turing Machines, combining Turing machine, Universal Turing Machine, Post Machine, Chomsky Hierarchy, Post correspondence problem.

Uncomputability: Halting Problem, Turing enumerability, Turing Acceptability and Turing decidabilities, unsolvable problems about Turing machines, Rice's theorem.

Recommended Books:

1. Hopcroft J. E., Ullman J. D. and Motwani R., Introduction to Automata Theory, Languages and Computation, Pearson Education, 3rd Edition, (2006).
2. John C. Martin, Introduction to Languages and the Theory of Computation, McGraw-Hill Higher Education (2011).
3. Daniel A. Cohen, Introduction to Computer Theory, John Wiley and Sons, 2nd Ed, 1996
4. Michael Sipser, Introduction to the Theory of Computation, Thomson, 2nd Ed, 2007