	School of Engineering & Technology
	Navrachana University, Vadodara, Gujarat, India-391 410
	Website: http://www.nuv.ac.in

Course Code:		**Course Title:**	Theory of Computation	
Course Structure (L T P):			Lecture : 3 Tutorial: 0 Practical : 0 Total Credits : 3	Page: 1 of 2
				Year of Introduction: 2016-17
				Semester : Fourth
				Level : B. Tech – II
Qualifies for	Compiler Design			
Prerequisites	Discrete Mathematics			
Course Description	This course introduces formal models of computation and the problems that they can solve. It presents Turing machines and equivalent models of computation. It also discusses the fundamental limitations of what can be computed. It covers finite state machines, regular expressions and regular grammars as well as context-free languages and grammars and non-context free grammars. It includes algorithms and decision procedures for regular and context-free languages, Turing machine, decidability and complexity analysis.			
Course Objective	Student will try to: 1. Construct finite state machines and the equivalent regular expressions. 2. Prove the equivalence of languages described by finite state machines and regular expressions. 3. Construct pushdown automata and the equivalent context free grammars. 4. Prove the equivalence of languages described by pushdown automata and context free grammars. 5. Construct Turing machines and Post machines. 6. Prove the equivalence of languages described by Turing machines.			
Learning Outcomes	Students will be able to: 1. Understand the importance of automata as a modelling tool of computational problems. 2. Understand the role of context-free languages and their limitations. 3. Understand the basis of theory of computation, in particular the role of key problems in defining classes of equivalent problems from a computational perspective. 4. Understand the limitations of computational procedures.			

Course Outlines	**Unit 1 Automata** **9 Hours** Strings, Alphabet, Language, Operations, Finite State Machine, definitions, finite automation model, acceptance of strings and languages, on deterministic finite automation, deterministic finite automation, Equivalence between NFA and DFA, Conversion of NFA into DFA, minimization of FSM, equivalence between two FSM's, Moore and Mealy machines. **Unit 2 Regular Expressions** **9 Hours** Regular sets, regular expressions, identity rules, manipulation of regular expressions, equivalence between RE and FA, inter conversion, Closure properties of regular sets(proofs not required),regular grammars, right linear and left linear grammars equivalence between regular linear grammar and FA, inter conversion between RE and RG. **Unit 3 Context Free Grammars** **9 Hours** Context free Grammars, Derivation trees, Left Most Derivations, Right Most Derivations, and Ambiguity in Context-Free Grammars, Simplification of Context Free Grammars, Normal Forms, Chomsky Normal Form (CNF). **Unit 4 Turing Machine** **9 Hours** Turing machine, definition, model, design of TM, Computable Functions, recursive enumerable language, Church's Hypothesis, Counter machine, types of TM's (Proofs not required). **Unit 5 Classes Of Problems** **9 Hours** Chomsky hierarchy of languages, linear bounded automats and context sensitive language, Introduction to DCFL and DPDA, LR(O) Grammar, decidability of problems, Universal Turing Machine, definition of P and NP problems, NP complete and NP hard Problem.

Text / Reference Books	**Text Books:**
	1. Hopcroft, John E.; Motwani, Rajeev; Ullman, Jeffrey D. (2013). Introduction to Automata Theory, Languages, and Computation (3rd ed.). Pearson. ISBN 1292039051
	2. Peter Linz, "An Introduction to Formal Language and Automata", Third Edition, Narosa Publishers, New Delhi, 2002 **Reference Books:**
	   1. John C Martin, "Introduction to Languages and the Theory of Computation", Third Edition, Tata McGraw Hill Publishing Company, New Delhi, 2007
	   2. Kamala Krithivasan and Rama. R, "Introduction to Formal Languages, Automata Theory and Computation", Pearson Education 2009