ITE1006	Theory of Computation	L	T	P	J	C
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Pre-requisite	**MAT1014**	**Syllabus version**				
		1.0				

Course Objectives:

- To introduce the mathematical foundations of computation
- To develop mathematical proofs for computation and algorithms.
- To prepare students in automation theory, formal languages, algorithms & logic

Expected Course Outcome:

1) Demonstrate the knowledge of fundamental concepts related to mathematical preliminaries and automata theory
2) Analyse the deterministic finite machine to accept the languages.
3) Analyse the non-deterministic finite machine to accept the languages.
4) Use and apply important properties of finite automaton to derive regular expressions from finite automation and vice versa
5) Analyse the context free grammar to simplify, remove ambiguity and perform conversion
6) Design push down automata for information technology related applications and to perform conversion between context free grammar and push down automation.
7) Design Turing machine for information technology related applications.

Student Learning Outcomes (SLO):	**1, 5**

[1] Having an ability to apply knowledge of mathematics, science and engineering

[5] Having design thinking capability

Module:1	**Mathematical preliminaries**	**5 hours**

Sets-Sequences and tuples- functions and relation-graphs-Types of proof-proof by construction, proof by contradiction, proof by induction-Introduction-Strings, Languages, Grammars, Automata.

Module:2	**Deterministic Finite Automata (DFA)**	**5 hours**

Introduction to Finite automata (FA) and examples – Language acceptance and string acceptance by a DFA-Closure properties-Minimization of finite automata-Regular languages- Non regular languages.

Module:3	**Non- Deterministic Finite Automata(NFA)**	**6 hours**

Introduction and examples-Conversion from DFA to NFA Finite Automata with Epsilon transitions- Equivalence of NFA and DFA - FA with output-Moore and mealy machine.

Module:4	**Regular Expression (RE)**	**5 hours**
Recursive definition of regular expression-Regular set-Identities of RE-Equivalence of RE-Identity rules-Inter Conversion RE and FA, Pumping lemma.		
Module:5	**Context-free Grammar (CFG)**	**6 hours**
Introduction- Definition, Right-linear grammar-left linear grammar-conversion from right linear grammar to left linear grammar-derivation and ambiguity-Simplification of CFG-Normal forms		
Module:6	**Push down automata (PDA)**	**6 hours**
Definition- Construction of pushdown automata- Equivalence of push down automata and context-free grammar.		
Module:7	**Turing machine(TM)**	**10 hours**
Definition-Design of Turing machine-Types of Turing machines - Introduction to Context sensitive grammar and languages-Linear bounded automata. **Undecidabilty:** Recursively enumerable and recursive languages - Undecidable problems - Halting and PCP problem - Halting problem is undecidable - Chomsky hierarchy of languages.		
Module:8	**Contemporary issues:**	**2 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	Michael Sipser, Introduction to the Theory of Computation, Third Edition, Wadsworth Publishing Co Inc, 2012.
Reference Books	
1.	Lewis H.P. & Papadimition C.H., Elements of Theory of Computation, Second Edition, PHI, 2015.
2.	Peter Linz, Introduction to Formal Languages and Automata Theory, PHI, 2011.

Recommended by Board of Studies	05-03-2016		
Approved by Academic Council	No. 40	Date	18-03-2016