Course Code	PCS21C08J	Course Name	THEORY OF COMPUTATION	Course Category	C	Professional Core	L	T	P	C
							4	0	2	5

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Science		Data Book / Codes/Standards	Nil	

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	*Understand the importance of theory of computation.*
CLR-2 :	*Understand the applications of TOC in various fields.*
CLR-3 :	*Learn the basics of pushdown automata.*
CLR-4 :	*Get Familiarity with the Turing machines.*
CLR-5 :	*Learn about the computable languages and functions.*

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	PSO 1	PSO 2	PSO 3
CLO-1 :	*Understand the role of a TOC in the industry.*	3	80	70	L	H	-	H	L	-	-						-	-	-
CLO-2 :	*Understand the applications of TOC in various fields.*	3	85	75	M	H	L	M	L	-	-						-	-	-
CLO-3 :	*To understand and discuss selected advanced topics.*	3	75	70	M	H	M	H	L	-	-						-	-	-
CLO-4 :	*To describe about the topics in TOC.*	3	85	80	M	H	M	H	L	-	-						-	-	-
CLO-5 :	*Understand the concept of a construction of programming languages.*	3	85	75	H	H	M	H	L	-	-						-	-	-

Duration (Hour)		18	18	18	18	18
S-1	SLO-1	*An introduction to finite automata*	*Grammar introduction*	*Pushdown automata*	*Turing machines*	*Decidability and Recursively Enumerable*
	SLO-2	*Basic mathematical notation and techniques*	*Types of grammar*	*Instantaneous descriptions*	*Definitions of Turing machines*	*The Definition of an Algorithm*
S-2	SLO-1	*Finite State systems*	*Context free grammar and languages*	*Deterministic pushdown automata*	*Representations of turing machine*	*Decidability*
	SLO-2	*Basic Definitions*	*Moves*	*Examples*	*Representation of transition table*	*Decidable Languages*
S3	SLO-1	*Finite automation*	*Derivations and languages*	*Definitions*	*Representation of Transition diagram*	*Undecidable Languages*
	SLO-2	*Transistion systems*	*Simplification of CFG*	*PDA*	*Language acceptability by Turing Machines*	*Problems*
S4	SLO-1	*Equivalence of NFA and DFA*	*Operations on Languages*	*Acceptance by pda*	*Design of turing machines*	*Halting Problems of Turing Machine*
	SLO-2	*Example problems Has to be solved.*	*Examples*	*CFL-Introduction*	*Description of turing machines*	*Example*
S 5- 6	SLO-1	*Laboratory 1: Draw a deterministic and non-deterministic finite automate which accept 00 and 11 at the end of a string containing 0, 1 in it, e.g., 01010100 but not 000111010.*	*Laboratory 4:Construct a PDA for language L = {0n1m | n >= 1, m >= 1, m > n+2}*	*Laboratory 7: Construct a PDA for language L = {ww' | w={0, 1}*} where w' is the reverse of w.*	*Laboratory 10: Program to illustrate Chomsky Hierarchy in Theory of Computation*	*Laboratory 13: Design a deterministic finite automata (DFA) for accepting any language.*
	SLO-2					
S 7	SLO-1	*Regular languages*	*Elimination of useless symbols*	*Pushdown automata*	*Techniques for TM Constructions*	*The p9ost Correspondence Problemn*
	SLO-2	*Identities for regular expressions*	*Context-free Languages and Derivation Trees*	*context-free languages*	*Turing Machine with stationary Head*	*Problems to solve*
S 8	SLO-1	*Finite automation with €*	*Ambiguity*	*Parsing and pushdown Automata*	*Storage in the State*	*Computability*
	SLO-2	*Transition system containing A- moves*	*Normal forms for context-free Grammars*	*Problems*	*Examples*	*Introduction and Basic Concepts*

Duration (Hour)		18	18	18	18	18
S 9	SLO-1	*Equivalence of NDFA'S with and without € moves*	*Relationship between derivation and derivation trees*	*Top- down parsing*	*Multiple Track Turing Machine*	*Primitive Recursive Functions*
	SLO-2	*Construction of finite automata equivalent*	*Explanation of derivative trees*	*Examples*	*Problems*	*Initial Functions*
S 10	SLO-1	*basic definitions of PDA*	*null productions*	*Top-down parsing using deterministic pda's*	*Multitape Turing machine*	*Primitive Recursive Functions over N*
	SLO-2	*Acceptance of PDA*	*Elimination for null productions*	*Problems*	*Problems*	*Primitive Recursive Functions Over {a,b}*
S 11-12	SLO-1	*Laboratory 2: Draw a deterministic and non-deterministic finite automata which accept a string containing "the" anywhere in a string of {a-z}, e.g., "there" but not "those".*	*Laboratory 5: Construct a PDA for language L = {$0^n1^m2^m3^n$ | n>=1, m>=1}*	*Laboratory 8: Draw a deterministic finite automata which recognize a string containing binary representation 0, 1 in the form of multiple 3, e.g., 1001 but not 1000.*	*Laboratory 11Write a program to define The halting problem.*	*Laboratory 14: Design a deterministic finite automata(DFA) for accepting the language L = {a^nb^m| n+m= even}*
	SLO-2					
S 13	SLO-1	*DFA & NDFA*	*Unit productions,*	*Bottom-up parsing*	*Non – Deterministic Turing Machine*	*Recursive Functions*
	SLO-2	*Equivalence of finite automation and regular expressions*	*Elimination for unit productions*	*Problems*	*Problems*	*Partial Recursive Functions and Turing Machines*
S 14	SLO-1	*Minimization of DFA*	*Greiback normal form*	*LR(K) Grammars*	*The Model of Linear Bounded Automation*	*Computability*
	SLO-2	*Minimization of DFA problems*	*Examples*	*Examples*	*Relation Between LBA and Context Sensitive Languages*	*A Turing Model for Computation*
S 15	SLO-1	*Pumping Lemma for regular sets*	*Chomsky normal form*	*Properties of LR(K) Grammars*	*TM and Type 0 Grammers*	*Turing – computable Functions*
	SLO-2	*Problems based on pumping Lemma.*	*Problems*	*Explanation of each and every property*	*Construction of Grammer Corresponding to TM*	*Construction of the Turing Machine that can compute the Zero Function Z*
S 16	SLO-1	*regular expression*	*Problems related to CNF*	*Closure properties of languages*	*Linear bounded Automata and languages*	*Construction of the Turing Machine for Computing - The Successor function*
	SLO-2	*Identities for Regular Expressions*	*Problems related to GNF*	*Examples*	*Problems*	*Construction of Turing Machine that can perform Recursion*
S 17-18	SLO-1	*Laboratory 3: Draw a deterministic and non-deterministic finite automata which accept a string containing "ing" at the end of a string in a string of {a-z}, e.g., "anything" but not "anywhere".*	*Laboratory 6: Construct a PDA for language L = {wcw' | w={0, 1}*} where w' is the reverse of w.*	*Laboratory 9: Take an example to convert CFG to CNF. Consider the given grammar G1:* *S → ASB* *A → aAS|a|ε* *B → SbS|A|bb*	*Laboratory 12 : Program to illustrate Chomsky Hierarchy in Theory of Computation*	*Laboratory 15: Draw a deterministic finite automata which recognize a string containing binary representation 0, 1 in the form of multiple 2, e.g., 1010 but not 01101.*
	SLO-2					

Learning Resources	1. Jeffery D Ullman, Motwani R John E Hopcroft Introduction to Automata theory language and computation second edition Pearson education 2008. 2. John C Matin " Introduction to language and the theory of Computation" third edition Tata Mc Graw Hill 2007.

Learning Assessment											
Bloom's Level of Thinking		Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100%	

CLA – 4 can be from any combination of these: Assignments, Seminars, Short Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Mr. S. Karthik, Assistant Consultant, Tata Consultancy Services	Dr.S.Sasikala, Associate Professor and Head, Dept. of Computer Science, University of Madras	1. Mrs. E.Aarthi 2. Dr. P. Muthulakshmi