CS204: Theory of Computation				**Elementary set theory, Relations, Mappings, and some abstract algebra**
	3	**1**	**0**	

Course Objective: To provide knowledge and skills in theoretical foundations of computing that are needed to study and practice computer science.

S. No	Course Outcomes (CO)
CO1	Construct, analyze and interpret Regular languages, Expression and finite automata (FA) with and without output
CO2	Design, analyze and interpret Context Free languages, Expression and Grammars
CO3	Design and analyze different types of Push down Automata (PDA) as Simple Parser.
CO4	Design different types of Turing Machines as Acceptor, Verifier, Translator and Basic computing machines and Apply to propose computation solutions.

CO5	Compare and analyze different languages, grammars, automata and machines and appreciate their power and convert automata to programs and functions

S. No	Contents	Contact Hours
UNIT 1	Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, Distinguishing one string from other, Myhill-Nerode Theorem.	**10**
UNIT 2	Regular expression (RE): Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages. Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, FA. with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA	**10**
UNIT 3	Context free grammar (CFG):Definition, Examples, Derivation , Derivation trees, Ambiguity in Grammar, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Context Free Languages (CFL): Closure properties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Membership, Pumping lemma for CFLs.	**8**
UNIT 4	Push Down Automata (PDA): Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two stack PDA.	**8**
UNIT 5	Turing machines (TM): Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computer of Integer functions, Universal TM, Church's Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability, Undecidable problems about TMs. Post correspondence problem (PCP), Modified PCP, Introduction to recursive function theory.	**10**
	Total	**48**