

1.	Title of the course	Theory of Computation
2.	Course number	CS205L
3.	Structure of credits	3-0-0-3
4.	Offered to	UG
5.	New course/modification to	Modification To CS2202/8
6.	To be offered by	Department of Computer Science and Engineering
7.	To take effect from	July 2022
8.	Prerequisite	Nil
9.	<b>Course Objective(s):</b> To learn the notion of formal languages and expressiveness; To classify formal languages with respect to key theoretical models of computations.	
10.	<b>Course Content:</b> Introduction, language membership problem, Deterministic Finite Automata(DFA), regular languages, pumping lemma; Non-deterministic Finite Automata(NFA) and its equivalence to DFAs; NFA with epsilon transitions, regular expressions and their equivalence to regular languages; Closure properties, decision problems, Myhill-Nerode theorem and minimization of DFA; Context-Free Grammar(CFG) and Context-Free Language(CFL): derivation, parse trees, language generated by a CFG, ambiguity, Chomsky normal form, pumping lemma, closure properties, decision problems; Pushdown automata (PDAs), instantaneous descriptions, acceptance by final states and by empty stack and their equivalence; Equivalence of PDAs and CFGs; Turing machines(TM), instantaneous description, notion of acceptance, robustness of the model; Church-Turing hypothesis; Recursively enumerable (r.e.) and recursive languages; TM codes, existence of non-r.e. languages; Notion of undecidable problems; Universal language and Universal TM, reduction and undecidability; Introduction to theory of NP-completeness.	
11.	<b>Textbook(s):</b> 1. Hopcroft J, Ullman J D and Motwani R, <i>Introduction to Automata Theory, Languages and Computation</i> , 3rd Edition, Pearson (2008). 2. Sipser M, <i>Introduction to the Theory of Computation</i> , 3rd Edition, Cengage Learning (2012).	
12.	<b>Reference(s):</b> 1. Lewis H R and Papadimitriou C H, <i>Elements of the Theory of Computation</i> , 2nd Edition, Pearson (2015). 2. Martin J, <i>Introduction to Languages and the Theory of Computation</i> , 3rd Edition, McGraw Hill Education (2007).	