Course Title	Theory of Computation				
Course Code	CSE400				
Course Type	Compulsory				
Level	Bachelor (1st Cycle)				
Year / Semester	4^{th} Year / 7^{st} Semester				
Teacher's Name	TBA				
ECTS	6	Lectures / week	3 Hours/ 14 weeks	Laboratories / week	N/A
Course Purpose and Objectives	Introduce students to the mathematical foundations of computation including automata theory; the theory of formal languages and grammars; the notions of algorithm, decidability, complexity, and computability. Enhance/develop students' ability to understand and conduct mathematical proofs for computation and algorithms.				
Learning Outcomes	Upon successful completion of the course, students will be able to: • Describe and explain the operation and limitations of various computational models. • Analyse and design models of Deterministic and Non-Deterministic Finite Automatons, Push-Down Automatons for various languages • Apply various forms of the pumping lemma in proofs. • Analyse and design models of Turing Machines for computational problems • Define the classes P, NP and describe NP-completeness • Explain and use polynomial time reductions • Explain key notions, such as algorithm, computability, decidability, and complexity through problem solving. • Prove the basic results of the Theory of Computation.				
Prerequisites	CSE200	Co-requisites	None		

Course Content	Review: Basic algebraic concepts: sets, functions, mappings, binary operators, relations, partially ordered sets, equivalence classes. Introduction to alphabets and languages Finite Automata: Deterministic finite automata, Non-Deterministic finite automata. Equivalence of Deterministic and non-deterministic finite automata. Properties of languages accepted by finite automata, finite automata and regular expressions. Regular and non-regular languages (proof). Reduction of number of states in finite automata. Pushdown automata. Languages and Grammars: Properties of regular grammars and languages, The pigeonhole principle, A pumping Lemma. Context-free languages, derivation trees, pushdown automata and context-free grammars. Closure, periodicity, algorithmic properties. Transformation of grammars (Useless Productions, lambda, unit productions), Normal forms (Chomsky, Greibach), membership. Turing Machines: Definition, computing with Turing machines, Turing machine extensions, Nondeterministic Turing machines, Church-Turing Thesis. Definition of "algorithm" Decidability: Decidable languages, the halting problem Reducibility: Undecidable problems in language theory, a simple undecidable problem, mapping reducibility Computational Complexity: Measuring complexity, The class P, the class NP, NP-completeness, NP-complete problems
Teaching Methodology	Face- to- face
Bibliography	Sipser, M., INTRODUCTION TO THE THEORY OF COMPUTATION, PWS Publishing Company John C. Martin, INTRODUCTION TO LANGUAGES AND THE THEORY OF COMPUTATION, McGraw-Hill,

	Lewis, R., Papadimitriou H., ELEMENTS OF THE THEORY OF COMPUTATION, Prentice-Hall Hopcroft J., Motwani R., Ullman J., INTRODUCTION TO AUTOMATA THEORY, LANGUAGES, AND COMPUTATION, Addison-Wesley D. I. A. Cohen, INTRODUCTION TO COMPUTER THEORY, 2nd Ed., Wiley, 1997
Assessment	Mid – Term Examination: 25% Final Examination: 45% Assignments/Lab: 20% Class Participation: 10% 100%
Language	English