COURSE TITLE	**THEORY OF AUTOMATA & FORMAL LANGUAGE**
COURSE CODE	**01AI0505**
COURSE CREDITS	**3**

Objective:

1 This subject will introduce students to the algorithms, formal languages and grammars, automata theory, decidability, complexity, and computability. It helps students to understand and conduct mathematical proofs for computation and algorithms.

Course Outcomes: After completion of this course, student will be able to:

1 To apply proved results using proof by induction, proof by contradiction, proof by construction, proof by case exhaustion. (Application)

2 To acquire knowledge about the formal languages and grammars (Comprehension)

3 Gain the knowledge Finite automata and Push down automata (Application)

4 Construct the Turing machine for recursive and recursively enumerable languages. (Analyze)

5 Understand the computational problems regarding their computability and complexity. (Higher order thinking)

Pre-requisite of course:NA

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	0	50	30	20	0	0

Contents : Unit	Topics	Contact Hours
1	**Preliminaries** Set theory, propositions, predicate logic, relation, one-to-one function, onto function, bijection function, Direct proof, proof by contradiction, proof by contrapositive, Principle of mathematical induction, Recursive Definition	4
2	**Regular Languages** Symbol, Alphabet, String, Language, Regular expression and Language, Pumping Lemna	3
3	**Finite State Machine** Basics of Automata theory, Finite automata, Deterministic and Non-Deterministic Automata, ^ - Transition Finite automata, Conversion NFA - ^ to NFA, Conversion NFA to DFA, Conversion RE (Regular Expression) to Non-Deterministic Finite Automata, Subset Algorithm to convert Non DFA to DFA, Finite automata minimization, Moore and Mealey machine and their Conversion.	9

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Contents : Unit	Topics	Contact Hours
4	**Context Free Grammar (CFG)** Context free language, Chomsky normal forms, Greibach normal forms, derivation - derivation tree with their relation, Ambiguous and unambiguous CFG, Algebraic expression, Closure properties of Context Free Language.	8
5	**Push Down Automata (PDA)** Introduction about PDA, equivalence between CFG and PDA, Deterministic PDA, Pumping Lemna for Context Free Language, Acceptance of Empty and Final state.	6
6	**Turing machine and REL** Basics of Turing machine, Language acceptor, Turing machine variations, Church Turing thesis, Universal Turing machine, Looping vs Halting, Recursively and Enumerable Languages	6
7	**Computability** Partial function, Primitive recursive functions, undecidable problem, Class P and NP, Np Completeness.	6
Total Hours		**42**

Textbook :

1 Introduction to Languages and the Theory of Computation , Martin, John C , Tata Mcgraw Hill Education Private Limited , -

References:

1 Introduction to Languages and the Theory of Computation, Introduction to Languages and the Theory of Computation, Martin, John C, Tata Mcgraw Hill Education Private Limited, -

2 Theory of Computation, Theory of Computation, Moret, Bernard M, Pearson Education, -

3 Elements of The Theory of Computation, Elements of The Theory of Computation, Lewis, Harry R, Phi Learning pvt Ltd., -

4 Fundamentals of the Theory of Computation, Fundamentals of the Theory of Computation, Greenlaw, Raymond Hoover, H. James, Morgan Kaufmann Publishers, -

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery

Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
12.00	33.00	38.00	12.00	5.00	0.00

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Instructional Method:

1 The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, also need to use ICT tools and facilities.

2 The internal evaluation will be done on the basis of continuous evaluation of students in the class-room.

Supplementary Resources:

1 http://nptel.ac.in

2 https://archive.nptel.ac.in/courses/106/106/106106049/

3 https://archive.nptel.ac.in/courses/106/103/106103070/#

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