Professional Elective – I
Paper Name: Digital Forensics
Paper Code: PEC-CS501B
Credit: 3
Lesson Plan

University Name:	University of Engineering and Management, Kolkata
Stream:	CSE/CSE(AIML)
Course Type:	Theoretical Computer Science
Paper Name:	Formal Languages and Automata Thoery
Paper Code:	PCC-CSE502
Credit:	4/3
Course Educational Objective:	Through this paper students will enhance their knowledge in mathematical models of programming languages, computers and capability of a computer.
Pre-Requisites:	Elementary discrete mathematics including the notion of set, function, relation, product, partial order, equivalence relation, graph & tree. They should have a thorough understanding of the principle of mathematical induction.

Course Outcome:	CO1	To understand the symbol, alphabet, string, formal languages, grammar, theoretical machine/automata
	CO2	To understand FA, DFA, NFA, their conversions and applications
	CO3	To understand regular languages, expressions
	CO4	To understand CFG, CFL, DCFL, Non-DCFL, PDA, DPDA, NDPDA
	CO5	To understand Turing machine
	CO6	To understand Decidability, Undecidability, NP-Completeness

Serial Number	Module No.	Chapter Name	Topic	Lecture No.	CO Mapping
1	01	Introduction	Introduction to concepts of alphabet, language, production rules, grammar and automaton	01-02	CO1
2	01	Finite Automata	Finite state model, concept of DFA and its problems, concept of NFA and its problems	03-05	CO2
3	01	Finite Automata	NFA to DFA conversion, Construction of DFA & NFA for any given string and vice versa, Minimization of FA and equivalence of two FA, Mealy & Moore machine and their problems, Limitations of FSM	05-10	CO2

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Serial Number	Module No.	Chapter Name	Topic	Lecture No.	CO Mapping
4	02	Regular language and expression	Introduction to the concept of Chomsky Classification of Grammar, language generation from production rules and vice- versa. regular language and regular expressions, identity rules	11-13	**CO3**
5	02	Regular language and expression	Arden's theorem state and prove, Construction of NFA from regular expression, Conversion of NFA with null moves to without null moves, closure properties, pumping lemma and its applications	14-16	**CO3**
6	03	Context Free Grammar, Languages	Introduction to Context Free Grammar, Derivation trees, sentential forms. Right most and leftmost derivation of strings, concepts of ambiguity. Minimization of CFG, Chomsky normal form, Greibach normal form, Pumping Lemma for Context Free Languages, Enumeration of properties of CFL (proofs omitted)	17-19	**CO4**
7	03	Context Free Grammar, Languages	Closure property of CFL, Ogden's lemma & its applications, Push Down Automata: Push down automata, definition and description, Acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence	20-22	**CO4**
8	03	Push Down Automata	Equivalence of CFL and PDA, interconversion, DCFL and DPDA	23-25	**CO4**

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Serial Number	Module No.	Chapter Name	Topic	Lecture No.	CO Mapping
9	04	Turing Machine	Turing Machine, definition, model, Design of TM, Computable functions, Church's hypothesis, counter machine, Types of Turing machines (proofs not required), Universal Turing Machine, Halting problem	26-28	**CO5**
10	04	Turing Machine	Decidability, Undecidability, P, NP	29-30	**CO6**
11	05	Finite State Machine	Basic definition of sequential circuit, block diagram, mathematical representation, concept of transition table and transition diagram, Design of sequence detector	31-32	**CO1**
12	05	Finite State Machine	Finite state machine: Definitions, capability & state equivalent, kth-equivalent concept, Merger graph, Merger table	33-34	**CO1**
13	05	Finite State Machine	Compatibility graph, Finite memory definiteness, testing table & testing graph	35	**CO1**

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	Title	Author(s)	Publishing House	Edition
Text Books:	Introduction to the Theory of Computation	Michael Sipser	PWS Publishing	Fifteenth Edition
	Introduction to Automata Theory, Languages, and Computation	John E. Hopcroft, Rajeev Motwani, and Jeffrey D. Ullman	Pearson Education Asia	Latest Edition
	Theory of Computer Science: Automata, Languages and Computation	Mishra K.L.P	PHI	Third Edition
	Introduction to Languages and The Theory of Computation	John Martin	Pearson	Latest Edition
Reference Books:	Automata and Computability, Undergraduate Texts in Computer Science	Dexter C. Kozen	Springer	Latest Edition