

Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
							Sessional	Final Exam	Total
COM-503	Theory of Computation	PCC	4	3	1	0	50	100	150

**Course Outcomes:**

At the end of the course the student will be able to:	
CO1	Apply DFA and NFA concepts to design and analyze finite automata.
CO2	Analyze context-free grammars and the Pumping Lemma for language properties.
CO3	Design computational models using various Turing machine models.
CO4	Evaluate Push Down Automata models for their acceptance criteria of context-free languages.
CO5	Assess properties of recursive and recursively enumerable languages for decidability issues.

**Detailed Syllabus****Section-A**

**Unit 1:** Finite Automata: Deterministic Finite Automata (DFA), Designing, Non- deterministic finite Automata (NFA) without E-moves, Conversions, Equivalence, NFA with E-moves, Regular expression designing, Finite machine with output assigned, Moore and mealy machines, Conversion and Equivalence, Myhill-Nerode Theorem. **(12 Hrs.)**

**Unit 2:** Regular Grammar & Context free Languages: Context free Grammar, Context free Languages, reduced form of Grammar, Ambiguous and Non- Ambiguous grammar, acceptors and generators, Relations between Classes of Languages, Pumping lemma of regular sets, Chomsky's hierarchy of languages, derivation Trees, CYK Algorithm for CFL Membership, Testing emptiness of CFLs. **(12 Hrs.)**

**Section-B**

**Unit 3:** Turing Machines: Church Testing Hypothesis, Turing Computability, Non- deterministic, Multitape and other versions of Turing machines, Churches Hypothesis, Primitive Recursive functions, Universal Turing machines, decidability, Halting problem, Stack Automata. **(8 Hrs.)**

**Unit 4:** Push Down Automata: Definition, Model, Acceptance of CFL, Acceptance by Final State and Acceptance by Empty stack and its Equivalence, Equivalence of CFG and PDA. **(6 Hrs.)**

**Unit 5:** Recursive and Recursively Enumerable Languages (rel): Properties of recursive and recursively enumerable languages, Context sensitive language and linear bounded automata (LBA), Chomsky hierarchy, Decidability, Post's correspondence problem (PCKP), undecidability of PCP. **(6 Hrs.)**

**Text Books**

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Introduction to Automata Theory, Languages and Computation	J Hopcroft, JD Ullman, R Motwani,	Pearson	3 <sup>rd</sup> (2008)
2	Elements of the Theory of Computation	Harry Lewis and Christos Papadimitriou	Pearson	2 <sup>nd</sup> (2015)

**Reference Books**

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Theory of Computer Science-Automata Languages and Computation	K. L. P Mishra, N. Chandrashekar	Prentice Hall of India, India	3 <sup>rd</sup> (2006)
2	Introduction to the Theory of Computation	Michael Sipser	Cengage India Private Limited	3 <sup>rd</sup> (2014)