

COURSE CODE	COURSE TITLE	L	T	P	C
1151CS109	THEORY OF COMPUTATION	3	0	0	3

Course Category: Program Core

A. Preamble:

This Course helps the learners to know the models of computation, along with their variants in the context of formal languages and their recognizers. This can be applied in designing compilers and pattern recognition system.

B. Prerequisite Courses:

Sl. No	Course Code	Course Name
1	1151CS102	Data Structures

C. Related Courses:

Sl. No	Course Code	Course Name
1	1151CS115	Compiler Design

D. Course Outcomes:

Upon the successful completion of the course, students will be able to:

CO Nos.	Course Outcomes	Level of learning domain (Based on revised Bloom's taxonomy)
CO1	Design a finite automaton to recognize a given regular language.	K3
CO2	Build a Simplified Context Free Grammar for any language.	K3
CO3	Design a Pushdown automata model for context free grammar and vice versa.	K3
CO4	Develop a Computational model using Turing machine for the given problem.	K3
CO5	Examine the Unsolvable and Complexity for the given problems.	K3

E. Correlation of COs with POs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS O1	PSO 2	PS O 3
CO1	H	H	H	H		L						H	H	M	H
CO2	H	H	H	H		L						L	H	M	H
CO3	H	H	H	H	M	L						L	H	M	H
CO4	H	H	M	H	M	L						L	H	M	H
CO5	H	H	L	M	M							L	M		H

H- High; M-Medium; L-Low

F. Course Content:

UNIT I FINITE AUTOMATA

L – 9

Introduction- Finite Automaton – DFA & NFA – Finite Automaton with ϵ - moves – Equivalence of NFA and DFA – Equivalence of NFA's with and without ϵ -moves – Regular Languages- Regular Expression –Equivalence of finite Automaton and regular expressions

UNIT II GRAMMARS

L – 9

Introduction– Types of Grammar - Context Free Grammars and Languages– Derivations and Languages – Ambiguity- Relationship between derivation and derivation trees – Simplification of CFG– Greiback Normal form –Chomsky normal form

UNIT III PUSHDOWN AUTOMATA

L – 9

Pushdown Automata- Definitions – Moves – Instantaneous descriptions – Deterministic pushdown automata – Equivalence of Pushdown automata and CFL –pumping lemma

UNIT IV TURING MACHINES

L – 9

Definitions of Turing machines – Models – Computable languages and functions –Techniques for Turing machine construction – Multi head and Multi tape Turing Machines - The Halting problem – Partial Solvability - Chomskian hierarchy of languages.

UNIT V UNSOLVABLE PROBLEMS AND COMPUTABLE FUNCTIONS

L – 9

Unsolvability Problems and Computable Functions – Primitive recursive functions – Recursive and recursively enumerable languages – Universal Turing machine P and NP completeness - Polynomial time reductions.

TOTAL: 45 Periods

G. Learning Resources:

i. Text Books

1. John E Hopcraft, Rajeev Motwani, Jeffrey D Ullman, "Introduction to Automata Theory, Languages and Computation", PEA, Second Edition, 2001
2. Michael Sipser. Introduction to the Theory of Computation, Second Edition, Cengage Learning, India

ii. Reference Books:

1. Green Law, Hoover, "Fundamentals of the Theory of Computation – Principles and practice", Morgan & Kauffman Publishers, 1998
2. Daniel I.A. Cohen "Introduction to Computer Theory" Wiley-India, ISBN: 978-81-265-1334-5
3. E V Krishnamurthy, "Introduction to Theory of Computer Science", EWP Second 2nd Ed.
4. K.L.P Mishra, N. Chandrasekaran, "Theory of Computer Science (Automata, Languages and Computation)", Prentice Hall India, 2nd Edition
5. Daniel I.A. Cohen, "Introduction to Automata Theory Languages and Computations", Pearson Education Asia, Second Edition.