



SRI KRISHNA INSTITUTE OF TECHNOLOGY

(Accredited by NAAC Approved by A.I.C.T.E. New Delhi, Recognized by Govt. of Karnataka & Affiliated to V.T U., Belagavi)

#57, Chimney Hills, Hesaraghatta Main Road, Chikkabanavara Post, Bengaluru- 560090

Department of Artificial Intelligence and Machine Learning

Academic Year	:	2025-26	Course Name	:	Theory of Computation
Semester	:	V	Course Code	:	BCS503
Scheme	:	2022	L:T:P: C	:	3:2:0:4
Total Contact hours	:	50	CIE Marks	:	50
Course Plan Author	:	B. Vidhya Banu	SEE Marks	:	50
Date	:	21/07/2025	Total Marks	:	100

Course Prerequisites:

- Knowledge about Discrete Mathematics.
- Knowledge about Set Theory.

Learning Objectives:

- Introduce core concepts in Automata and Theory of Computation.
- Identify different Formal Language Classes and their Relationships.
- Learn concepts of Grammars and Recognizers for different formal languages.
- Prove or disprove theorems in automata theory using their properties.
- Determine the decidability and intractability of Computational problems.

Course Outcomes:

CO	At the end of the course, student should be able to . . .	Blooms' Level
CO1	: Define the fundamental concepts of formal languages, automata, grammars and explain the principles of decidability and undecidability in computational theory.	L2
CO2	: Prove the properties of regular and context-free languages using regular expressions	L3
CO3	: Design DFA,NFA, Epsilon-NFA, Pushdown automata (PDAs) and Turing machines to solve the computational problems for formal languages	L3

Blooms' Taxonomy:

L1	L2	L3	L4	L5	L6
Remembering	Understanding	Applying	Analyzing	Evaluating	Creating



SRI KRISHNA INSTITUTE OF TECHNOLOGY

(Accredited by NAAC Approved by A.I.C.T.E. New Delhi, Recognized by Govt. of Karnataka & Affiliated to V.T U., Belagavi)

#57, Chimney Hills, Hesaraghatta Main Road, Chikkabanavara Post, Bengaluru- 560090

Program Outcomes:

PO1	:	Engineering knowledge	PO7	:	Environment and sustainability
PO2	:	Problem analysis	PO8	:	Ethics
PO3	:	Design/development of solutions	PO9	:	Individual and team work
PO4	:	Conduct investigations of complex problems	PO10	:	Communication
PO5	:	Modern tool usage	PO11	:	Project management and finance
PO6	:	The engineer and society	PO12	:	Life-long learning

Program Specific Outcomes:

PSO1:	Graduates will have the ability to adapt, contribute and innovate ideas in the field of Artificial Intelligence and Machine Learning
PSO2:	To provide a concrete foundation and enrich their abilities to qualify for Employment, Higher studies and Research in various domains of Artificial Intelligence and Machine Learning such as Data Science, Computer Vision, and Natural Language Processing with Ethical Values.
PSO3:	Graduates will acquire the practical proficiency with niche technologies and open-source platforms and to become Entrepreneur in the domain Artificial Intelligence and Machine Learning.

CO-PO-PSO Mapping:

CO	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	-	-	-	-	-	-	2	2	-	-
CO2	2	2	-	-	-	-	-	-	-	-	-		1	1	-
CO3	3	3	3	-	3	-	-	-	1	-	-		1	2	1
Target	2	2.5	2.7	1	1.3	-	-	-	0.7	-	-	0.8	1.2	0.8	0.4

Course Content (Syllabus)

Module 1	CH
Introduction to Finite Automata, Structural Representations, Automata and Complexity. The Central Concepts of Automata Theory. Deterministic Finite Automata, Nondeterministic Finite Automata, An Application: Text Search, Finite Automata with Epsilon-Transitions. TEXT BOOK: Sections 1.1, 1.5, 2.2,2.3,2.4,2.5	10



SRI KRISHNA INSTITUTE OF TECHNOLOGY

(Accredited by NAAC Approved by A.I.C.T.E. New Delhi, Recognized by Govt. of Karnataka & Affiliated to V.T U., Belagavi)

#57, Chimney Hills, Hesaraghatta Main Road, Chikkabanavara Post, Bengaluru- 560090

Module 2	
Regular Expressions, Finite Automata and Regular Expressions, Proving Languages not to be Regular. Closure Properties of Regular Languages, Equivalence and Minimization of Automata, Applications of Regular Expressions TEXT BOOK: Sections 3.1, 3.2 (Except 3.2.1), 3.3, 4.1, 4.2, 4.4	10
Module 3	
Context-Free Grammars, Parse Trees, Ambiguity in Grammars and Languages, Ambiguity in Grammars and Languages, Definition of the Pushdown Automaton, The Languages of a PDA, Equivalence of PDA's and CFG's, Deterministic Pushdown Automata. TEXT BOOK: Sections 5.1, 5.2, 5.4, 6.1, 6.2, 6.3.1, 6.4	10
Module 4	
Normal Forms for Context-Free Grammars, The Pumping Lemma for Context-Free Languages, Closure Properties of Context-Free Languages. TEXT BOOK: Sections 7.1, 7.2, 7.3	10
Module 5	
Introduction to Turing Machines: Problems That Computers Cannot Solve, The Turing Machine, Programming Techniques for Turing Machines, Extensions to the Basic Turing Machine, Undecidability: A Language That Is Not Recursively Enumerable. TEXT BOOK: Sections 8.1, 8.2, 8.3, 8.4, 9.1, 9.2	10



SRI KRISHNA INSTITUTE OF TECHNOLOGY

(Accredited by NAAC Approved by A.I.C.T.E. New Delhi, Recognized by Govt. of Karnataka & Affiliated to V.T U., Belagavi)

#57, Chimney Hills, Hesaraghatta Main Road, Chikkabanavara Post, Bengaluru- 560090

Schedule of Instruction:

Class No	Topic	Date	RBT	CO	Mode
Module-1					
1.	Introduction to Finite Automata,	4/8/25	L2	1	Lecture
2.	Structural Representations, Automata and Complexity.	5/8/25	L2	1	Lecture
3.	The Central Concepts of Automata Theory.	6/8/25	L2	1	Lecture
4.	Deterministic Finite Automata	7/8/25	L3	1	Lecture/JFLAP
5.	Nondeterministic Finite Automata	8/8/25	L3	1	Lecture
6.	Nondeterministic Finite Automata	11/8/25	L3	1	Lecture
7.	Finite Automata	12/8/25	L3	1	Lecture/JFLAP
8.	An application: Text Search,	19/8/25	L2	1	Lecture
9.	Finite Automata with Epsilon-Transitions.	21/8/25	L3	1	Lecture
10.	Revision	22/8/25		1	Problem Based Learning
Module-2					
11.	Regular Expressions	25/8/25	L2	2	Lecture
12.	Finite Automata and Regular Expressions	26/8/25	L2	2	Lecture/JFLAP
13.	Finite Automata and Regular Expressions	28/8/25	L2	2	Lecture/JFLAP
14.	Proving Languages not to be Regular.	29/8/25	L2	2	Lecture
15.	Proving Languages not to be Regular.	2/9/25	L2	2	Lecture
16.	Closure Properties of Regular Languages,	3/9/25	L2	2	Lecture
17.	Closure Properties of Regular Languages,	8/9/25	L2	2	Lecture
18.	Equivalence and Minimization of Automata,	9/9/25	L2	2	Lecture
19.	Applications of Regular Expressions	9/9/25	L2	2	Lecture
20.	Revision	10/9/25			Problem Based Learning
Module-3					
21.	Context-Free Grammars	11/9/25	L3	3	Lecture
22.	Parse Trees,	12/9/25	L3	3	Lecture
23.	Ambiguity in Grammars and Languages,	15/9/25	L3	3	Lecture
24.	Leftmost Derivation as a way to express Ambiguity	16/9/25	L3	3	Lecture



SRI KRISHNA INSTITUTE OF TECHNOLOGY

(Accredited by NAAC Approved by A.I.C.T.E. New Delhi, Recognized by Govt. of Karnataka & Affiliated to V.T.U., Belagavi)

#57, Chimney Hills, Hesaraghatta Main Road, Chikkabanavara Post, Bengaluru- 560090

Class No	Topic	Date	RBT	CO	Mode
25.	Definition of the Pushdown Automaton,	17/9/25	L3	3	Video
26.	The Languages of a PDA,	18/9/25	L3	3	Video
27.	Equivalence of PDA's and CFG's,	22/9/25	L3	3	Video
28.	From PDA's to Grammars	23/9/25	L3	3	Lecture/JFLAP
29.	Deterministic Pushdown Automata.	24/9/25	L3	3	Video
30.	Revision	29/9/25			Problem Based Learning
Module-4					
31.	Normal Forms for Context-Free Grammars,	30/9/25	L3	3	Lecture
32.	Eliminating Useless Symbols	6/10/25	L3	3	Lecture
33.	Computing the generating & Reachable Symbols	7/10/25	L3	3	Lecture
34.	Eliminating Epsilon- Production	8/10/25	L3	3	Lecture
35.	Eliminating Unit Production	13/10/25	L3	3	Lecture
36.	The Pumping Lemma for Context-Free Languages	14/10/25	L3	3	Lecture
37.	The Pumping Lemma for Context-Free Languages	15/10/25	L3	3	Lecture
38.	Closure Properties of Context-Free Languages.	16/10/25	L3	3	Lecture
39.	Closure Properties of Context-Free Languages.	17/10/25	L3	3	Lecture
40.	Revision				Problem Based Learning
Module-5					
41.	Introduction to Turing Machines:	17/10/25	L2	3	Lecture
42.	Introduction to Turing Machines: Problems That Computers Cannot Solve The Turing Machine	23/10/25	L2	3	Lecture
43.	Programming Techniques for Turing Machines	24/10/25	L3	3	Lecture/JFLAP
44.	Programming Techniques for Turing Machines	27/10/25	L3	3	Lecture/JFLAP
45.	Extensions to the Basic Turing Machine,	28/10/25	L2	3	Lecture
46.	Extensions to the Basic Turing Machine,	29/10/25	L2	3	Lecture



SRI KRISHNA INSTITUTE OF TECHNOLOGY

(Accredited by NAAC Approved by A.I.C.T.E. New Delhi, Recognized by Govt. of Karnataka & Affiliated to V.T.U., Belagavi)

#57, Chimney Hills, Hesaraghatta Main Road, Chikkabanavara Post, Bengaluru- 560090

Class No	Topic	Date	RBT	CO	Mode
47.	Undecidability: A Language That Is Not Recursively Enumerable	30/10/25	L2	4	Lecture
48.	Undecidability: A Language That Is Not Recursively Enumerable	3/11/25	L2	4	Lecture
49.	Revision	4/11/25 -	L2	4	Lecture
50.	Revision	13/11/25			Problem Based Learning

Textbooks:

T1	John E Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, "Introduction to Automata Theory, Languages and Computation", Second Edition, Pearson.
----	--

Reference books:

R1	Elain Rich, "Automata, Computability and complexity", 1st Edition, Pearson Education, 2018.
R2	K.L.P Mishra, N Chandrashekar, 3rd Edition, "Theory of Computer Science", PHI, 2012.
R3	Peter Linz, "An introduction to Formal Languages and Automata", 3rd Edition, Narosa Publishers, 1998.
R4	Michael Sipser : Introduction to the Theory of Computation, 3rd edition, Cengage learning, 2013.

Web links and Video Lectures (e-Resources):

1	https://tinyurl.com/VBanu
2	https://archive.nptel.ac.in/courses/106/105/106105196/
3	https://archive.nptel.ac.in/courses/106/106/106106049/
4	https://nptelvideos.com/course.php?id=717

Assessment Schedule:

S.N	Assessment Type	Content	CO	Duration	Marks	Date
1.	CIE 1 (Theory)	Module-1,2,3	CO1, CO2, CO3	1.30hr	25	6/10/25
2.	CIE 2 (Theory)	Module -3,4,5	CO3, CO4, CO5	1.30hr	25	25/11/25
3.	Assignment-1(Class Test)	Module-1,2,3	CO1, CO2, CO3		10	
4.	Assignment-2 (JFLAP)	Module -1,2,3,5	CO1-5		15	



SRI KRISHNA INSTITUTE OF TECHNOLOGY

(Accredited by NAAC Approved by A.I.C.T.E. New Delhi, Recognized by Govt. of Karnataka & Affiliated to V.T U., Belagavi)

#57, Chimney Hills, Hesaraghatta Main Road, Chikkabanavara Post, Bengaluru- 560090

5.	Semester End Examination		CO1-5	3hr	50	

RB – Text Book/Reference Book, **L* – Lecture, *V*- Videos or any other mode, **RBT* – Revised Blooms' Taxonomy, *L: T: P: C* – Theory/Lecture: Tutorial: Practical/Drawing: Credits, *SEE*: Semester End Examination, *CIE*: Continuous Internal Evaluation, *Seminar*: Group of 6-8 students, *Module* 1,2,3,4 & 5,

The weightage of Continuous Internal Evaluation (*CIE*) is 50% and for Semester End Exam (*SEE*) is 50%. The minimum passing mark for the *CIE* is 40% of the maximum marks (20 marks out of 50) and for the *SEE* minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the *CIE* (Continuous Internal Evaluation) and *SEE* (Semester End Examination) taken together.

B. Vidhya Banu
Faculty In charge

Course Coordinator

HoD