Logo	SKIT	Teaching Process	Rev No.: 1.0
	Doc Code:	INST.Ph5b1.F02	Date: 3-08-2018
	Title:	Course Plan	Page: 1 / 29

Copyright ©2017. cAAS. All rights reserved.

Table of Contents

15CS54 : Automata Theory & Computability	2
A. COURSE INFORMATION	2
1. Course Overview	2
2. Course Content	2
3. Course Material	
4. Course Prerequisites	
B. OBE PARAMETERS	
1. Course Outcomes	
2. Course Applications	4
3. Articulation Matrix	4
4. Mapping Justification	5
5. Curricular Gap and Content	5
6. Content Beyond Syllabus	5
C. COURSE ASSESSMENT	6
1. Course Coverage	6
2. Continuous Internal Assessment (CIA)	6
D1. TEACHING PLAN - 1	6
Module - 1	6
Module – 2.	8
E1. CIA EXAM – 1	9
a. Model Question Paper - 1	9
b. Assignment -1	11
D2. TEACHING PLAN - 2	
Module – 3.	12
Module – 4	
E2. CIA EXAM – 2	
a. Model Question Paper - 2	
b. Assignment – 2.	
D3. TEACHING PLAN - 3	17
Module – 5.	
E3. CIA EXAM – 3	
a. Model Question Paper - 3	
b. Assignment – 3	
F. EXAM PREPARATION	19
1. University Model Question Paper	
2. SEE Important Questions	

Note : Remove "Table of Content" before including in CP Book

Each Course Plan shall be printed and made into a book with cover page

Blooms Level in all sections match with A.2, only if you plan to teach / learn at higher levels

Logo	SKIT	Teaching Process	Rev No.: 1.0
	Doc Code:	INST.Ph5b1.F02	Date: 3-08-2018
	Title:	Course Plan	Page: 2 / 29

Copyright ©2017. cAAS. All rights reserved.

15CS54 : Automata Theory & Computability

A. COURSE INFORMATION

1. Course Overview

Degree:	B.E	Program:	CS
Semester :	V	Academic Year:	2018-19
Course Title:	Automata Theory & Computability	Course Code:	15CS54
Credit / L-T-P:	4-0-0	SEE Duration:	3 Hours
Total Contact Hours:	50	SEE Marks:	80 Marks
CIA Marks:	20	Assignment	5
Course Plan Author:	Savita B Patil	Sign:	Dt:
Checked By:		Sign:	Dt:

2. Course Content

Mod	Module Content	Teaching	Module	Blooms
ule		Hours	Concepts	Level
1	Why study the Theory of Computation, Languages and Strings: Strings,Languages. A Language Hierarchy, Computation, Finite State Machines(FSM): Deterministic FSM, Regular languages, Designing FSM,Nondeterministic FSMs, From FSMs toOperational Systems, Simulators for FSMs, Minimizing FSMs, Canonical form of Regular languages, Finite State Transducers, Bidirectional Transducers.	10	Abstract State Machine Computational Models	L2,L4
2	Regular Expressions (RE): what is a RE?, Kleene's theorem, Applications of REs, Manipulating and Simplifying REs. Regular Grammars: Definition,Regular Grammars and Regular languages. Regular Languages (RL) and Nonregular Languages: How many RLs, To show that a language is regular, Closure properties of RLs, to show some languages are not RLs	10	Pattern Language Rule Based System	L3.L4
3	Context-Free Grammars(CFG): Introduction to Rewrite Systems and Grammars,CFGs and languages, designing CFGs, simplifying CFGs, proving that a Grammar is correct, Derivation and Parse trees, Ambiguity, Normal Forms. Pushdown Automata (PDA): Definition of non-deterministic PDA, Deterministic and Non-deterministic PDAs, Non-determinism and Halting, alternative equivalent definitions of a PDA, alternatives that are not equivalent to PDA.	10	Rule Based System Automata For CFG	L4
4	Context-Free and Non-Context-Free Languages: Where do the Context-Free Languages(CFL) fit, Showing a language is context-free, Pumping theorem for CFL, Important closure properties of CFLs, Deterministic CFLs. Algorithms and Decision Procedures for CFLs: Decidable questions, Un-decidable questions. Turing Machine: Turing machine model, Representation, Language acceptabilityby TM, design of TM, Techniques for TM construction.	10	Pumping Lemma Abstract Computer	L3,L4
5	Variants of Turing Machines (TM), The model of Linear Bounded automata: Decidability: Definition of an algorithm, decidability, decidable languages, Undecidable languages, halting problem of TM, Post correspondence problem. Complexity: Growth rate of functions, the classes of P and NP, Quantum Computation: quantum computers, Church-Turing	10	Multi Tape TM Linear Bounded Automata	L3

CS

Lo	go	SKIT	Teaching Process		Rev No.: 1.0	0
		Doc Code:	INST.Ph5b1.F02		Date: 3-08	-2018
		Title:	Course Plan		Page: 3 / 2	29
Copyright	©2017. cA	AS. All rights reserved				_
t	hesis.					
6						

3. Course Material

Mod	Details	
ule	Details	Available
1	Text books:	
	1 Elaine Rich, Automata, Computability and Complexity, 1st Edition, Pearson	In Lib
	Education, 2012/2013	ln Lib
	Phl, 2012.	
2	Reference books	
	1. John E Hopcroft, Rajeev Motwani, Jeffery D Ullman, Introduction to AutomataTheory,	In Lib
	 Languages, and computation, and Edition, Pearson Education, 2013 Michael Sipser : Introduction to the Theory of Computation, and edition, Cengage learning, 2013 	In Lib
	3. John C Martin, Introduction to Languages and The Theory of Computation, 3rd Edition, Tata McGraw –Hill Publishing Company Limited, 2013	In Lib
	4. Peter Linz, "An Introduction to Formal Languages and Automata", 3rd Edition, Narosa Publishers, 1998	In Lib
	5. Basavaraj S. Anami, Karibasappa K G, Formal Languages and Automata theory, Wiley India, 2012	In Lib
	6. C K Nagpal, Formal Languages and Automata Theory, Oxford University	In Lib
	press, 2012. Others (Web Video Simulation Notes etc.)	
3	there web, video, simulation, votes etc.)	Not Available
	1. <u>www.viupiunei.com/aowinioaa.pnp?type-papers5%2FFLA1Noles</u>	
	2. <u>vtu.ansynadus.com/cse/sem_5/index.pnp</u>	

4. Course Prerequisites

SNo	Course	Course Name	Module / Topic / Description	Sem	Remarks	Blooms
	Code					Level
1	15Cs36	DMS	Set Theory	3		L3
	-					

Note: If prerequisites are not taught earlier, GAP in curriculum needs to be addressed. Include in Remarks and implement in B.5.

B. OBE PARAMETERS

1. Course Outcomes

#	Cos	Teach.	Concept	Instr	Assessmen	Blooms'
		Hours		Method	t Method	Level
15CS54.1	Understand the Core Concepts Of	2	Computatio	Discussio	Assignment	L2
	Automata Theory,Define the	ė	nal Model	n	_	Understand
	mathematical principles behinc	l				
	theoretical computer science.					

Logo	SKIT Teaching Process					Rev N	0.: 1.0	
((25))	Doc Code:	INST.Ph5b1.F02	Ĭ			Date: (Date: 3-08-2018	
	Title:	Course Plan		Page: 4 / 29				
Copyright ©2017. 15CS54.2	cAAS. All rights reserved Design, Transla Between Diff machine(e.g:de Deterministics) the different ty	te, Differentiate erent abstract state eterministic,Non- ,and give examples for pes of automata	8	Abstract state machine	Problem solving	Slip test	L4 Analyze	
15CS54.3	Build, convert Finite State pattern match different types world applicati	Regular expression to machine to achieve ning, to correlate the of automata to real ons	5	Pattern Language	Lecture	Seminar	L3 Apply	
15CS54.4	Construct, cho grammar to ac appropriate au requirements computer scier	ose and design regular ccept regular language, tomata for the different outlined by theoretical nce.	5	Rule based system	Problem solving	Assignment	L4 Analyze	
15CS54.5	Design ,simplif free gramma languages & ex machine mode compiler theor	y and Analyze context or for context free els and descriptors to y and parsing	5	Rule based system	Problem solving	Slip test	L4 Analyze	
15CS54.6	Analyze,constr automata to grammar.	uct Push down accept context free	5	Automata for context free grammar	Discussio n Problem solving	Viva Assignment	L4 Analyze	
15CS54.7	Prove some context free pumping lemm	languages are not anguages using na.	2	Pumping lemma	Lecture	Seminar	L3 Apply	
15CS54.8	Analyze ,desigi	n turing machine .	8	Abstract machine	Discussio n Problem solving	Viva Assignment	L4 Analyze	
15CS54.9	Understand m to identify the problems ar complexity.	ultitape turing machine different computational nd their associated	2	Multitape turing machine	Lecture	Assignment	L2 Understand	
15CS54.10	Understand Lir	near bounded automata	8	State machine	Discussio n Problem solving	Viva Assignment	L3 Apply	
-		Total	50	-	-	-	-	

Note: Identify a max of 2 Concepts per Module. Write 1 CO per concept.

2. Course Applications

SNo	Application Area	CO	Level			
1	Acquire fundamental Understanding of the core concepts of automata theory.	CO1	L2			
2	commonly used to build software applications with finite state machines: Automata-based programming.	CO2	L4			
3	Regular expressions are useful in a wide variety of text processing tasks, simple parsing, useful on Internet search engines.					
4	Design Grammar and Automata for different language classes and become knowledgeable about restricted models of computation.	CO4	L4			
5	Used to describe the structure of programming languages,In most programming languages opening and closing of braces, curly brackets is taken care	CO5	L4			
6	Online transaction process system , Deterministic top down parsing .	CO6	L4			
7	Develop skills in formal reasoning and reduction of a problem to a formal model.	CO7	L3			
8	Any computation that can be carried out by a mechanical means can be performed	CO8	L4			

Logo	SKIT	Teaching Process	Rev No.: 1.0				
	Doc Code:	INST.Ph5b1.F02	Date: 3-08-1	2018			
	Title:	Course Plan F	Page: 5 / 29	9			
Copyright ©2017, cAAS. All rights reserved.							
	- ·						

		by some Turing machine		l l
	9	Genetic programming ,parse tree.	CO9	L2
	10	Classify a problem with respect to different models of computation.	CO10	L3
1	Mata	VV/rite 4 ar a applications nor CO		

Note: Write 1 or 2 applications per CO.

3. Articulation Matrix

(CO – PO MAPPING)

	-	Course Outcomes Program Outcomes														
	#	COs	Course attainment	PO 1	PO 2	PO 3	PO 1	PO 5	PO 6	PO 7	PO 8	PO a	PO 10	PO 11	PO 12	Leve
15C	S54.1	Understand the Core Concepts Of Automata Theory,Define the mathematical principles behind theoretical computer science.	1	1	1	1	1			1	1	1			1	L2
15C	:S54.2	Design,Translate, Differentiate Between Different abstract state machine(e.g:deterministic,N on-Deterministics),and give examples for the different types of automata	2	2	2	2	2		2			2			2	L4
15C	:S54.3	Build, convert Regular expression to Finite State machine to achieve pattern matching, to correlate the different types of automata to real world applications	2	2	2	2	2					2			2	L3
15C	:S54.4	Construct, choose and design regular grammar to accept regular language, appropriate automata for the different requirements outlined by theoretical computer science.	2	2	2	2	2		2			2			2	L4
15C	:S54.5	Design ,simplify and Analyze context free grammar for context free languages & explain the application of machine models and descriptors to compiler theory and parsing	2	2	2	2	2		2	2		2			2	L4
15C	S54.6	Analyze,construct Push down automata to accept context free grammar.	2	2	2	2	2		2	2		2			2	L4
15C	:S54.7	Prove some languages are not context free languages using pumping lemma.	2	2	2	2	2		2			2			2	L3
15C	S54.8	Analyze ,design turing machine .	2	2	2	2	2		2	2		2			2	L4
15C	S54.9	Understand,Analyze multitape turing machine to identify the different computational problems and their associated complexity.	1	1	1	1	1		1	1		1			1	L2

Logo	SKIT	Teaching Process											Rev No.: 1.0				
	Doc Code: INST.Ph5b1.F02										Date: 3-08-2018						
	Title:	Course Plan	ourse Plan											Page: 6 / 29			
Copyright ©2017. c	AAS. All rights reserved	·															
15CS54.10	Understand Li	near bounded	2	2	2	2	2		2	2		2			2	L3	
	automata																
				10	10	01	10	-	8	6	1	10	-	-	10		
CS501PC.	Average		1.8	1.8	1.8	1.8	1.8	-	1.8	1.6	1	1.8	-	-	1.8		
	Note: Mention the mapping strength as 1, 2, or 3																

(CO - PO MAPPING)

-	Course Outcomes			Program Outcomes												
#	COs	Hours	Course	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	Lev
			attainment	1	2	3	4	5	6	7	8	9	10	11	12	el
15CS54.1	Understand the Core	2	2	2	2	2	2			2	2	2			2	L2
	Concepts Of Automata	ł														
	Theory,Define the	2														
	mathematical principles															
	behind theoretica	L														
	computer science.															
15CS54.2	Design,Translate,	8	8	8	8	8	8		8			8			8	L4
	Differentiate Betweer	1														
	Different abstract state	2														
	machine(e.g.determinist															
	c,Non-															
	Deterministics), and give	2														
	examples for the	,														
	different types o	Ē														
1=00= 10	automata Ruilal agus gut Daguda			-	-	_	-					_			_	
150554.3	Build, convert Regular	5	5	5	5	5	5					5			5	L3
	Expression to Finite															
	achiovo pattorr															
	matching to correlate	7														
	the different types of	, =														
	automata to real world															
	applications	•														
15CS54.4	Construct, choose and	5	5	5	5	5	5		5			5			5	L4
0 0 0 1 1	design regular gramma		U U						Ŭ						Ŭ	
	to accept regula	-														
	language, appropriate	2														
	automata for the	2														
	different requirements	ò														
	outlined by theoretica	L														
	computer science.															
15CS54.5	Design ,simplify and	5	5	5	5	5	5		5	5		5			5	L4
	Analyze context free															
	grammar for context	-														
	avalain the application	L														
	of maching models and															
	descriptors to compile	-														
	theory and parsing															
1505546	Analyze construct Push	5	5	5	5	5	5		Б	5		Б			Б	
190094.0	down automata to	5	5	5	5	5	5		5	5		5			5	L4
	accept context free	2														
	grammar.															
15CS54.7	Prove some languages	2	2	2	2	2	2		2			2			2	L3
	are not context free	4														_
	languages using	1														
	pumping lemma.															

Logo	SKI	Т		Teaching Process									R	Rev No.: 1.0				
)) Doc C	ode:	INST.Ph	5b1.F02									D	ate	: 3-	08-	-201	.8
	💴 🔰 Titl	e:	Course F	ourse Plan									P	Page: 7 / 29				
Copyright ©2017. CAAS. All rights reserved.																		
15CS54.8	Analyze , machine .	desigi	n turing	8	8	8	8	8	8		8	8		8			8	L4
15CS54.9 Understand, Analyze multitape turing machine to identify the different computational problems and their associated complexity.				2	2	2	2	2	2		2	2		2			2	L2
15CS54.1 0	Understan bounded a	id autom	Linear ata	8	8	8	8	8	8		8	8		8			8	L3
						10	10	10	10	-	8	6	1	10	-	-	10	
	Sum hours	5			50	50	50	50	50	-	43	30	2	50	-	-	50	
CS501P	% hours				100	10	10	10	10	-	86	60	5	10	-	-	10	
Č.						0	0	0	0				_	0			0	
	Level				3	3	3	3	3	-	3	3	1	3	-	-	3	
	Note: Mention the mapping strength as 1, 2, or 3																	

par am eter	BL	Hrs	co- A	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO12
Hrs	L2- L4	5	3	3	3	3	3	-	3	3	1	3	-	-	3
Lev el	L2- L4	5	1.8	1.8	1.8	1.8	1.8	-	1.8	1.6	1	1.8	-	-	1.8
cou rse- Avg	L2- L4	5	2.4	2.4	2.4	2.4	2.4		2.4	2.3	1	2.4			2.4

4. Mapping Justification

Мар	ping	Justification					
со	PO	-	-				
CO1	PO1	The knowledge of mathematical principles will help the students to apply the same to formulate solutions for engineering problems.like designing compilers,natural language processing,AI	L1				
CO1	PO2	The knowledge of mathematical principles and automata theory will help the students to apply the same to identify and analyze engineering problems. Like how efficiently problems can be solved on a model of computation.to which extent a problem is solvable on a computer.	L1				
CO1	PO3	Thorough understanding mathematical principles and automata theory students can give solution to complex engineering problems which may be helpful in health ,safety & societal considerations. Like vending machines,elevators,traffic lights.					
CO1	PO4	Thorough understanding automata theory they can conduct investigation of complex problems can be solved on the computer. like medical diagnosis ,robot control,remote sensing .					
CO1	PO5	No tool is used so no mapping.					
CO1	P06	By understanding mathematical principles and automata theory students can apply contextual knowledge to assess solution to complex engineering problems which may be helpful in					

Doc Code: INST Physics Date 3:-08-2018 Convertised and the statety & societal considerations. Like It is used for Artificial Intelligence as part of making machines more intelligent. Is understand better the languages and be more efficient & Artificial Intelligence is widely used in health-are.Entertainment.finance etc. C01 PO7 Thorough understanding automata theory they can know the environmental contexts. C01 PO8 No ethical principles no mapping. C01 PO9 Student will develop individual knowledge to work in a team or Individually. C01 PO9 Student will develop individual knowledge to work in a team or Individually. C01 PO1 No management principles no mapping. C02 PO1 No management principles no mapping. C03 PO12 Study of automata theory is required if students want to work in gigstem based companies. C02 PO1 The study of finite state machines gives students to think in a logical way and will able blace to apply the knowledge in complex engineering problems. C02 PO2 Understanding of different state machines students and their state machines students can apply contextual knowledge processing. C02 PO2 Horeestranding of different types o	Logo	SKIT	Teaching Process Rev No			
Title Course Plan Page 8 / 29 Constant Sources Attrabusement Analysis and the source of the source		Doc Code:	INST.Ph5b1.F02 Date	e: 3-08-2018		
Dependent of the second seco		Title:	Course Plan Pag	e: 8 / 29		
health safety & societal considerations. Like It is used for Artificial Intelligence is ward of making machines more intelligent. It of understand better the languages and be more efficient & Artificial Intelligence is widely used in healthcare. Entertainment finance etc. C01 PO7 Thorough understanding automata theory they can know the environmental contexts. C01 PO8 No ethical principles no mapping. C01 PO8 No ethical principles no mapping. C01 PO10 No soft skills no mapping. C01 PO12 Student will develop individual knowledge to work in a team or individually. C01 PO12 Study of automata theory is required if students want to work in system bracked companies. C02 PO1 The study of finite state machines gives students to think in a logical way and will able able to apply the knowledge in complex engineering problems tike Al C02 PO2 Understanding of different automata will help to review and analyze engineering problems. Like natural language processing Al C02 PO3 Thorough understanding of abstract models for computational problems. Like natural ianguage processing Al C02 PO4 Study of automata with examples will help in conducting detailed investigation of complex engineering problems. Like whether efficient solution can be obtained or not. C02 PO6	Copyright ©2017. cA	AS. All rights reserved]] d.			
Intelligence as part of making machines more intelligent. to understand better the languages and be more efficient & Artificial Intelligence is widely used in healthcare.Entertainment,finance etc. C01 PO7 Thorough understanding automata theory they can know the environmental contexts. C01 PO8 No ethical principles no mapping. C01 PO9 Student will develop individual knowledge to work in a team or individually. C01 PO1 No management principles no mapping. C01 PO1 No management principles no mapping. C01 PO1 No management principles no mapping. C02 PO1 The study of finite state machines gives students to think in a logical way and will able able to apply the knowledge in complex engineering problems. L2 C02 PO2 Understanding of different types of automata will help in the design and development of abstract models for computational problems. Like natural language processing.Al L4 C02 PO4 Study of automata will help in conducting detailed investigation of complex engineering problems. Like whether efficient solution can be obtained or not. L4 C02 PO6 No tool is used so no mapping. C02 C02 PO6 No tool is used so no mapping. C02			health ,safety & societal considerations. Like It is used for Artifici	ial		
understand better the languages and be more efficient & Artificial intetligence is widely used in healthcare. Intertainment. Infrance etc. C01 PO7 Thorough understanding automata theory they can know the environmental contexts. C01 PO8 No ethical principles no mapping. C01 PO10 No soft skills no mapping. C01 PO11 No management principles no mapping. C01 PO12 Student will develop individual knowledge to work in a team or individually. C01 PO12 Study of automata theory is required if students want to work in system based companies. C02 PO1 The study of finite state machines gives students to think in a logical way and will able able to apply the knowledge in complex engineering problems like A1 C02 PO2 Understanding of different stutemata will help to review and analyze engineering problems. Like A1 C02 PO3 Thorough understanding of different types of automata will help in the design and development of abstract models for computational problems. Like natural tanguage processing.A1 C02 PO4 Study of automata with examples will help in conducting detailed investigation can be obtained or not. C02 PO5 No tool is used so no mapping. C02 PO6 No tool is used so no mapping.<			Intelligence as part of making machines more intelligent, to			
Intelligence is widely used in healthcare. Entertainment.finance etc. C01 PO7 Throrough understanding automata theory they can know the environmental contexts. C01 PO8 No ethical principles no mapping. C01 PO9 Student will develop individual knowledge to work in a team or individually. C01 PO10 No soft skills no mapping. C01 PO11 No management principles no mapping. C01 PO12 Study of automata theory is required if students want to work in system based companies. C02 PO1 The study of finite state machines gives students to think in a logical way and will able to apply the knowledge in complex engineering problems. C02 PO2 Understanding of different automata will help to review and analyze to engineering problems. C02 PO3 Thorough understanding of different types of automata will help in the design and development of abstract models for computational problems. Like anatral tanguage processing.Al C02 PO4 Study of automata with examples will help in conducting detailed investigation of complex engineering problems. Like whether efficient solution can be obtained or not. C02 PO6 Student will develop individual knowledge to work in a team or individual knowledge to assess solution to complex engineering problems.			understand better the languages and be more efficient & Artifici	al		
C01 PO7 Therough understanding automata theory they can know the environmental contexts. C01 PO8 No ethical principles no mapping. C01 PO9 Student will develop individual knowledge to work in a team or individually. C01 PO10 No soft skills no mapping. C01 PO11 No soft skills no mapping. C01 PO12 Study of automata theory is required if students want to work in system based companies. C02 PO11 The study of finite state machines gives students to think in a logical way and will able able to apply the knowledge in complex engineering problems. Like Al C02 PO2 Understanding of different types of automata will help in in the design and development of abstract models for computational problems. Like natural language processing.Al C02 PO3 Thorough understanding of different types of automata will help in conducting detailed in votsitig at a complex engineering problems. Like whether efficient solution can be obtained or not. C02 PO3 Thorough automata with examples will help in conducting detailed investigation (as no mapping). C02 PO6 By understanding finite state machines students can apply consextual knowledge to assess solution to complex engineering problems. Like whether efficient solution can be obtained or not. C02 PO6 By understanding finite state machines stud			Intelligence is widely used in healthcare,Entertainment,finance e	etc.		
environmental contexts. C01 P08 No ethical principles no mapping. C01 P09 Student will develop individual knowledge to work in a team or individually. C01 P010 No soft skills no mapping. C01 P011 No management principles no mapping. C01 P012 Study of automata theory is required if students want to work in system based companies. C02 P01 The study of finite state machines gives students to think in a logical way and will able able to apply the knowledge in complex engineering problems. C02 P02 Understanding of different automata will help to review and analyze engineering problems. C02 P03 Thorough understanding of different types of automata will help in the design and development of abstract models for computational problems. Like natural language processing.Al C02 P04 Study of automata with examples will help in conducting detailed investigation of complex engineering problems. Like whether efficient solution can be obtained or not. C02 P04 By understanding finite state machines students can apply contextual knowledge to asses solution to complex engineering problems which may be helpful in health, safety & societal considerations. C02 P07 Not contains environmental context so no mapping. C02 <td>CO1</td> <td>PO7</td> <td>Thorough understanding automata theory they can know the</td> <td></td>	CO1	PO7	Thorough understanding automata theory they can know the			
C01 PO8 No ethical principles no mapping. C01 PO9 Student will develop individual knowledge to work in a team or individually. C01 PO10 No soft skills no mapping. C01 PO11 No management principles no mapping. C01 PO12 Study of automata theory is required if students want to work in system based companies. C02 PO1 The study of finite state machines gives students to think in a logical way and will able able to apply the knowledge in complex engineering problems. C02 PO2 Understanding of different lypes of automata will help in the design and development of abstract models for computational problems. Like natural language processing.Al C02 PO3 Thorough understanding of different types of automata will help in the design and development of abstract models for computational problems. Like natural language processing.Al C02 PO4 Study of automata with examples will help in conducting detailed investigation of complex engineering problems. Like whether efficient solution can be obtained or not. C02 PO6 By understanding finite state machines students can apply contextual knowledge to assess solution to complex engineering problems which may be helpful in health .safety & societal considerations. C02 PO6 Not contains environmental context so no mapping. C02 PO6 Not cont			environmental contexts.			
C01 POg Student will develop individual knowledge to work in a team or individually. C01 PO10 No soft skills no mapping. C01 PO11 No management principles no mapping. C01 PO12 Study of automata theory is required if students want to work in system based companies. C02 PO1 The study of finite state machines gives students to think in a logical way and will able able to apply the knowledge in complex engineering problems like AI C02 PO2 Understanding of different automata will help to review and analyze engineering problems. L2 C02 PO3 Thorough understanding of different types of automata will help in the design and development of abstract models for computational problems. Like natural language processing.AI L4 C02 PO4 Study of automata with examples will help in conducting detailed investigation of complex engineering problems. Like whether efficient solution can be obtained or not. L4 C02 PO4 By understanding finite state machines students can apply contextual knowledge to assess solution to complex engineering problems. which may be helpful in health.safety & societal considerations. L4 C02 PO3 Not entails principles no mapping. C02 C02 PO4 No soft skills no mapping. C02 C02 PO3	CO1	PO8	No ethical principles no mapping.			
CO1 PO10 No soft skills no mapping. CO1 PO11 No soft skills no mapping. CO1 PO12 Study of automata theory is required if students want to work in system based companies. CO2 PO1 The study of finite state machines gives students to think in a logical way and will able able to apply the knowledge in complex engineering problems like AI CO2 PO2 Understanding of different types of automata will help in the design and development of abstract models for computational problems. Like natural language processing.AI CO2 PO3 Thorough understanding of different types of automata will help in the design and development of abstract models for computational problems. Like natural language processing.AI CO2 PO3 Study of automata with examples will help in conducting detailed investigation of complex engineering problems. Like whether efficient solution can be obtained or not. CO2 PO5 No tool is used so no mapping. CO2 PO6 By understanding finite state machines students can apply contextual knowledge to assess solution to complex engineering problems with may be helpful in health .safety & societal considerations. CO2 PO6 No ethical principles no mapping. CO2 PO6 No ethical principles no mapping. CO2 PO6 No ethical p	CO1	PO9	Student will develop individual knowledge to work in a team or			
C01 P010 No soft skills no mapping. C01 P011 No management principles no mapping. C01 P012 Study of automata theory is required if students want to work in system based companies. C02 P01 The study of finite state machines gives students to think in a logical way and will able able to apply the knowledge in complex engineering problems. C02 P02 Understanding of different automata will help to review and analyze lagengineering problems. C02 P03 Thorough understanding of different types of automata will help in the design and development of abstract models for computational problems. Like natural language processing.Al C02 P04 Study of automata with examples will help in conducting detailed investigation of complex engineering problems. Like whether efficient solution can be obtained or not. C02 P05 No tool is used so no mapping. C02 P06 No tool is used so no mapping. C02 P06 No ethical principles no mapping. C02 P06 No ethical principles no mapping. C02 P07 Not contains environmental context so no mapping. C02 P07 Not exoft skills no mapping. C02 P09 Study of automata theory is required if students want to work in system based companies			individually.			
CO1 PO11 No management principles no mapping. CO1 PO12 Study of automata theory is required if students want to work in system based companies. CO2 PO1 The study of finite state machines gives students to think in a logical way and will able able to apply the knowledge in complex engineering problems. like AI CO2 PO2 Understanding of different automata will help to review and analyze engineering problems. and development of abstract models for computational problems. Like natural tanguage processing.AI CO2 PO3 Thorough understanding of problems. Like whether deficient solution can be obtained or not. CO2 PO4 Study of automata with examples will help in conducting detailed investigation of complex engineering problems. Like whether efficient solution can be obtained or not. CO2 PO6 By understanding finite state machines students can apply contextual knowledge to assess solution to complex engineering problems. Which may be helpful in health safety & societal considerations. CO2 PO6 By understanding finite state machines for work in a team or individually. CO2 PO7 Not contains environmental context so no mapping. CO2 PO8 No ethical principles no mapping. CO2 PO10 No ethical principles no mapping. CO2 PO11	CO1	PO10	No soft skills no mapping.			
C01 P012 Study of automata theory is required if students want to work in system based companies. C02 P01 The study of finite state machines gives students to think in a logical way and will able able to apply the knowledge in complex engineering problems like AI C02 P02 Understanding of different automata will help to review and analyze engineering problems. L2 C02 P03 Thorough understanding of different types of automata will help in the design and development of abstract models for computational problems. Like natural language processing.AI L4 C02 P04 Study of automata with examples will help in conducting detailed investigation of complex engineering problems. Like whether efficient solution can be obtained or not. L4 C02 P05 No tool is used so no mapping. C02 C02 P06 By understanding finite state machines students can apply contextual knowledge to assess solution to complex engineering problems. which may be helpful in health .safety & societal considerations. C02 C02 P06 No toontains environmental context so no mapping. C02 C02 P08 No ethical principles no mapping. C02 C02 P010 No soft skills no mapping. C02 C02 P010 No soft skills no mapping. C02 C03<	CO1	PO11	No management principles no mapping.			
CO2 PO1 The study of finite state machines gives students to think in a logical way and will able able to apply the knowledge in complex engineering problems like AI CO2 PO2 Understanding of different automata will help to review and analyze engineering problems. L2 CO2 PO3 Thorough understanding of different types of automata will help in the design and development of abstract models for computational problems. Like natural language processing.AI L4 CO2 PO3 Study of automata with examples will help in conducting detailed investigation of complex engineering problems. Like whether efficient solution can be obtained or not. L4 CO2 PO5 No tool is used so no mapping. CO2 PO6 By understanding finite state machines students can apply contextual knowledge to assess solution to complex engineering problems. which may be helpful in health .safety & societal considerations. CO2 PO6 No to contains environmental context so no mapping. CO2 PO8 No ethical principles no mapping. CO2 PO8 No soft skills no mapping. CO2 PO1 No soft skills no mapping.	CO1	PO12	Study of automata theory is required if students want to work in system based companies.			
way and will able able to apply the knowledge in complex engineering problems like Al Image: Complex engineering problems CO2 PO2 Understanding of different automata will help to review and analyze engineering problems. L2 CO2 PO3 Thorough understanding of different types of automata will help in the design and development of abstract models for computational problems. Like natural language processing.Al L4 CO2 PO4 Study of automata with examples will help in conducting detailed investigation of complex engineering problems. Like whether efficient solution can be obtained or not. L4 CO2 PO6 By understanding finite state machines students can apply contextual knowledge to assess solution to complex engineering problems which may be helpful in health .safety & societal considerations. CO2 CO2 PO6 No e thical principles no mapping. CO2 CO2 PO7 Not contains environmental context so no mapping. CO2 CO2 PO3 Study of automata theory is required if students want to work in system based companies. Study of automata theory is required if students want to work in system based companies. CO2 PO1 No soft skills no formulate solutions for engineering problems uike search engines.string processing .natural language processing.Al CO3 PO1 The knowledge o	CO2	PO1	The study of finite state machines gives students to think in a loc	aical		
engineering problems like A1 C CO2 PO2 Understanding of different automata will help to review and analyze engineering problems. L2 CO2 PO3 Thorough understanding of different types of automata will help in the design and development of abstract models for computational problems. Like natural language processing.A1 L4 CO2 PO4 Study of automata with examples will help in conducting detailed investigation of complex engineering problems. Like whether efficient solution can be obtained or not. L4 CO2 PO5 No tool is used so no mapping. CO2 CO2 PO6 By understanding finite state machines students can apply contextual knowledge to assess solution to complex engineering problems which may be helpful in health ,safety & societal considerations. CO2 CO2 PO6 By understanding principles no mapping. CO2 CO2 PO8 No ethical principles no mapping. CO2 CO2 PO8 No ethical principles no mapping. CO2 CO2 PO10 No soft skills no mapping. CO2 CO2 PO11 No management principles no mapping. CO2 CO2 PO11 No eathormata theory is required if students want to work in system based			way and will able able to apply the knowledge in complex	,		
CO2 PO2 Understanding of different automata will help to review and analyze engineering problems. L2 CO2 PO3 Thorough understanding of different types of automata will help in the design and development of abstract models for computational problems. Like natural language processing.Al L4 CO2 PO4 Study of automata with examples will help in conducting detailed investigation of complex engineering problems. Like whether efficient solution can be obtained or not. L4 CO2 PO6 By understanding finite state machines students can apply contextual knowledge to assess solution to complex engineering problems which may be helpful in health .safety & societal considerations. CO2 CO2 PO6 By understanding ping. CO2 CO2 PO7 Not cool is used so no mapping. CO2 CO2 PO6 By understanding ping. CO2 CO2 PO7 Not contains environmental context so no mapping. CO2 CO2 PO3 Student will develop individual knowledge to work in a team or individually. CO2 CO2 PO3 Study of automata theory is required if students want to work in system based companies. CO2 CO2 PO1 No soft skills no mapping. CO2 <t< td=""><td></td><td></td><td>engineering problems like Al</td><td></td></t<>			engineering problems like Al			
engineering problems. CO2 PO3 Thorough understanding of different types of automata will help in the design and development of abstract models for computational problems. Like natural language processing.Al CO2 PO4 Study of automata with examples will help in conducting detailed investigation of complex engineering problems. Like whether efficient solution can be obtained or not. L4 CO2 PO5 No tool is used so no mapping. CO2 CO2 PO6 By understanding finite state machines students can apply contextual knowledge to assess solution to complex engineering problems which may be helpful in health.safety & societal considerations. CO2 PO7 Not contains environmental context so no mapping. CO2 PO7 Not contains environmental context so no mapping. CO2 PO7 Not contains environmental context so no mapping. CO2 PO7 Not contains environmental context so no mapping. CO2 PO7 No to contains environmental context so no mapping. CO2 PO10 No soft skills no mapping. CO2 PO11 No management principles no mapping. CO2 PO12 Study of automata theory is required if students want to work in system based companies. CO3	CO2	PO2	Understanding of different automata will help to review and ana	lyze L2		
CO2 PO3 Thorough understanding of different types of automata will help in the design and development of abstract models for computational problems. Like natural language processing.AI CO2 PO4 Study of automata with examples will help in conducting detailed investigation of complex engineering problems. Like whether efficient solution can be obtained or not. L4 CO2 PO5 No tool is used so no mapping. L4 CO2 PO6 By understanding finite state machines students can apply contextual knowledge to assess solution to complex engineering problems which may be helpful in health .safety & societal considerations. L4 CO2 PO7 Not contains environmental context so no mapping. CO2 CO2 PO3 Student will develop individual knowledge to work in a team or individually. Image: Social study of automata theory is required if students want to work in system based companies. CO2 PO1 No santiskils no mapping. CO2 CO3 PO1 The knowledge of regular expressions will help the students to apply the same to formulate solutions for engineering problems. System based companies. CO3 PO2 Correlating the study of automata theory is availed availedation, data scraping (especially web scraping), data wrangling. CO3 PO3 The real world applications study of RE will help to desig			engineering problems.			
the design and development of abstract models for computational problems. Like natural language processing.Al CO2 PO4 Study of automata with examples will help in conducting detailed investigation of complex engineering problems. Like whether efficient solution can be obtained or not. L4 CO2 PO6 By understanding finite state machines students can apply contextual knowledge to assess solution to complex engineering problems which may be helpful in health .safety & societal considerations. CO2 CO2 PO6 By understanding finite state machines students can apply contextual knowledge to assess solution to complex engineering problems which may be helpful in health .safety & societal considerations. CO2 PO7 Not contains environmental context so no mapping. CO2 CO2 PO8 Study of automata theory is required if students want to work in system based companies. Study of automata theory is required if students want to work in system based companies. CO3 PO1 The knowledge of regular expressions will help the students to apply the same to formulate solutions for engineering problems like search engines.string processing .natural language processing.Al CO3 PO2 Correlating the study of automata to real world applications will aid in formulating engineering problems with similar background and arriving at with solutions like data varigling. CO3 PO3 The real world application study of RE will	CO2	PO3	Thorough understanding of different types of automata will help	in L4		
CO2 PO4 Study of automata with examples will help in conducting detailed investigation of complex engineering problems. Like whether efficient solution can be obtained or not. L4 CO2 PO5 No tool is used so no mapping. Image: Co2 PO6 By understanding finite state machines students can apply contextual knowledge to assess solution to complex engineering problems which may be helpful in health .safety & societal considerations. Image: Co2 PO7 Not contains environmental context so no mapping. Image: Co2 PO7 Not contains environmental context so no mapping. Image: Co2 PO8 No ethical principles no mapping. Image: Co2 PO9 Student will develop individual knowledge to work in a team or individually. Image: Co2 PO1 No soft skills no mapping. Image: Co2 PO1 No management principles no mapping. Image: CO2 PO1 Study of automata theory is required if students want to work in sy			the design and development of abstract models for computation	nal		
C02 P04 Study of automata with examples will help in conducting detailed investigation of complex engineering problems. Like whether efficient solution can be obtained or not. L4 C02 P05 No tool is used so no mapping. C02 C02 P06 By understanding finite state machines students can apply contextual knowledge to assess solution to complex engineering problems which may be helpful in health ,safety & societal considerations. C02 P07 Not contains environmental context so no mapping. C02 P08 No ethical principles no mapping. C02 P09 Student will develop individual knowledge to work in a team or individually. C02 P01 No soft skills no mapping. C02 P011 No management principles no mapping. C02 P011 No management principles no mapping. C03 P01 The knowledge of regular expressions will help the students to apply the same to formulate solutions for engineering problems.like search enginees.string processing.natural language processing.Al C03 P02 Correlating the study of automata to real world applications will aid in formulating engineering problems with similar background and arriving at with solutions like data validation, data scraping (especially web scraping), data wrangling. C03 P03 The real world applications study of Re will help to			problems. Like natural language processing,AI			
investigation of complex engineering problems. Like whether efficient solution can be obtained or not. C02 P05 No tool is used so no mapping. C02 P06 By understanding finite state machines students can apply contextual knowledge to assess solution to complex engineering problems which may be helpful in health ,safety & societal considerations. C02 P07 Not contains environmental context so no mapping. C02 P08 No ethical principles no mapping. C02 P09 Student will develop individual knowledge to work in a team or individually. C02 P010 No soft skills no mapping. C02 P011 No management principles no mapping. C02 P012 Study of automata theory is required if students want to work in system based companies. C03 P01 The knowledge of regular expressions will help the students to apply the same to formulate solutions for engineering problems.like search engineering problems wilk similar background and arriving at with solutions like data validation, data scraping (especially web scraping), data wrangling. C03 P02 Correlating the study of automata to real world applications will aid in formulating engineering problems uith similar background and arriving at with solutions like data validation, data scraping (especially web scraping), data wrangling. C03 P04 <td>CO2</td> <td>PO4</td> <td>Study of automata with examples will help in conducting detaile</td> <td>ed L4</td>	CO2	PO4	Study of automata with examples will help in conducting detaile	ed L4		
efficient solution can be obtained or not. C02 P05 No tool is used so no mapping. C02 P06 By understanding finite state machines students can apply contextual knowledge to assess solution to complex engineering problems which may be helpful in health ,safety & societal considerations. C02 P07 Not contains environmental context so no mapping. C02 P07 Not contains environmental context so no mapping. C02 P08 No ethical principles no mapping. C02 P09 Student will develop individual knowledge to work in a team or individually. C02 P010 No soft skills no mapping. C02 P011 No management principles no mapping. C02 P011 No management principles no mapping. C02 P011 No soft skills no mapping. C03 P01 The knowledge of regular expressions will help the students to apply the same to formulate solutions for engineering problems.like search engines.string processing ,all anguage processing.Al C03 P02 Correlating the study of automata to real world applications will aid in formulating engineering problems with similar background and arriving at with solutions of similar kind engineering problems Like Regular expressions are used in web programming and in other pattern matching si			investigation of complex engineering problems. Like whether			
CO2 PO5 No tool is used so no mapping. CO2 PO6 By understanding finite state machines students can apply contextual knowledge to assess solution to complex engineering problems which may be helpful in health ,safety & societal considerations. CO2 PO7 Not contains environmental context so no mapping. CO2 PO8 No ethical principles no mapping. CO2 PO9 Student will develop individual knowledge to work in a team or individually. CO2 PO10 No soft skills no mapping. CO2 PO11 No management principles no mapping. CO2 PO10 No soft skills no mapping. CO2 PO11 No management principles no mapping. CO2 PO12 Study of automata theory is required if students want to work in system based companies. CO3 PO1 The knowledge of regular expressions will help the students to apply the same to formulate solutions for engineering problems.like search engines.string processing _natural language processing.Al CO3 PO2 Correlating the study of automata to real world applications will aid in formulating engineering problems with similar background and arriving at with solutions like data validation, data scraping (especially web scraping), data wrangling. CO3 PO3 The real world application study of RE will help to design and deve			efficient solution can be obtained or not.			
CO2 PO6 By understanding inite state machines students can apply contextual knowledge to assess solution to complex engineering problems which may be helpful in health .safety & societal considerations. CO2 PO7 Not contains environmental context so no mapping. CO2 PO8 No ethical principles no mapping. CO2 PO9 Student will develop individual knowledge to work in a team or individually. CO2 PO1 No eshits no mapping. CO2 PO1 No entical principles no mapping. CO2 PO1 No entical principles no mapping. CO2 PO1 No entical principles no mapping. CO2 PO1 No management principles no mapping. CO2 PO1 No management principles no mapping. CO3 PO1 The knowledge of regular expressions will help the students to apply the same to formulate solutions for engineering problems.like search engines.string processing.natural language processing.Al CO3 PO2 Correlating the study of automata to real world applications will aid in formulating engineering problems with similar background and arriving at with solutions like data validation, data scraping (especially web scraping), data wrangling. CO3 PO3 The real world application study of RE will help to design and develop solutions of similar kind engineering problems. Like	CO2	PO5	No tool is used so no mapping.			
CO1extual knowledge to assess solution to complex engineering problems which may be helpful in health .safety & societal considerations. CO2 PO7 Not contains environmental context so no mapping. CO2 PO8 No ethical principles no mapping. CO2 PO9 Student will develop individual knowledge to work in a team or individually. CO2 PO10 No soft skills no mapping. CO2 PO11 No management principles no mapping. CO2 PO12 Study of automata theory is required if students want to work in system based companies. CO3 PO1 The knowledge of regular expressions will help the students to apply the same to formulate solutions for engineering problems like search engines.string processing .natural language processing.Al CO3 PO2 Correlating the study of automata to real world applications will aid in formulating engineering problems with similar background and arriving at with solutions like data validation, data scraping (especially web scraping). data wrangling. CO3 PO3 The real world application study of RE will help to design and develop solutions of similar kind engineering problems. Like Regular expressions are used in web programming and in other pattern matching situations CO3 PO4 Study of Regular expressions CO3 PO5 No tool is used so no mapping. <td>CO2</td> <td>P06</td> <td>By understanding finite state machines students can apply</td> <td></td>	CO2	P06	By understanding finite state machines students can apply			
CO2 PO7 Not contains environmental context so no mapping. CO2 PO8 No ethical principles no mapping. CO2 PO9 Student will develop individual knowledge to work in a team or individually. CO2 PO10 No soft skills no mapping. CO2 PO11 No management principles no mapping. CO2 PO11 No management principles no mapping. CO2 PO12 Study of automata theory is required if students want to work in system based companies. CO3 PO1 The knowledge of regular expressions will help the students to apply the same to formulate solutions for engineering problems like search engines.string processing .natural language processing.Al CO3 PO2 Correlating the study of automata to real world applications will aid in formulating engineering problems with similar background and arriving at with solutions like data validation, data scraping (especially web scraping), data wrangling. CO3 PO3 The real world application study of RE will help to design and develop solutions of similar kind engineering problems. Like Regular expressions are used in web programming and in other pattern matching situations CO3 PO4 Study of Regular expressions CO3 PO5 No tool is used so no mapping. CO3 PO5 Not tool is used so no mapping.			contextual knowledge to assess solution to complex engineerin	ıg		
CO2 PO7 Not contains environmental context so no mapping. CO2 PO8 No ethical principles no mapping. CO2 PO9 Student will develop individual knowledge to work in a team or individually. CO2 PO1 No soft skills no mapping. CO2 PO1 No soft skills no mapping. CO2 PO1 No management principles no mapping. CO3 PO1 The knowledge of regular expressions will help the students to apply the same to formulate solutions for engineering problems like search engines.string processing .natural language processing.Al CO3 PO2 Correlating the study of automata to real world applications will aid in formulating engineering problems with similar background and arriving at with solutions like data validation, data scraping (especially web scraping), data wrangling. CO3 PO3 The real world application study of RE will help to design and develop solutions of similar kind engineering problems. Like Regular expressions are used in web programming and in other pattern matching situations CO3 PO4 Study of Regular expressions with			considerations			
CO2 PO4 No ethical principles no mapping. CO2 PO9 Student will develop individual knowledge to work in a team or individually. CO2 PO1 No soft skills no mapping. CO2 PO1 No soft skills no mapping. CO2 PO1 No soft skills no mapping. CO2 PO1 No management principles no mapping. CO2 PO1 No management principles no mapping. CO2 PO1 No management principles no mapping. CO3 PO1 The knowledge of regular expressions will help the students to apply the same to formulate solutions for engineering problems like search engines.string processing .natural language processing.Al CO3 PO2 Correlating the study of automata to real world applications will aid in formulating engineering problems with similar background and arriving at with solutions like data validation, data scraping (especially web scraping), data wrangling. CO3 PO3 The real world application study of RE will help to design and develop solutions of similar kind engineering problems. Like Regular expressions are used in web programming and in other pattern matching situations CO3 PO4 Study of Regular expressions with examples will help in conducting detailed investigation of complex engineering problems. Like lexical parsers for programming languages can be expressed and implemented using regular expressions	<u> </u>	PO7	Not contains environmental context so no mapping			
CO2 PO3 Student will develop individual knowledge to work in a team or individually. CO2 PO10 No soft skills no mapping. CO2 PO11 No management principles no mapping. CO2 PO12 Study of automata theory is required if students want to work in system based companies. CO3 PO1 The knowledge of regular expressions will help the students to apply the same to formulate solutions for engineering problems.like search engines,string processing ,natural language processing.Al CO3 PO2 Correlating the study of automata to real world applications will aid in formulating engineering problems with similar background and arriving at with solutions like data validation, data scraping (especially web scraping), data wrangling, CO3 PO3 The real world application study of RE will help to design and develop solutions of similar kind engineering problems Like Regular expressions are used in web programming and in other pattern matching situations CO3 PO4 Study of Regular expressions with examples will help in conducting detailed investigation of complex engineering problems. Like lexical parsers for programming languages can be expressed and implemented using regular expressions CO3 PO5 No tool is used so no mapping. CO3 PO6 Not contains environmental context so no mapping.	CO2		No ethical principles no mapping.			
CO2 PO10 No soft skills no mapping. CO2 PO11 No management principles no mapping. CO2 PO12 Study of automata theory is required if students want to work in system based companies. CO3 PO1 The knowledge of regular expressions will help the students to apply the same to formulate solutions for engineering problems.like search engines.string processing .natural language processing.Al CO3 PO2 Correlating the study of automata to real world applications will aid in formulating engineering problems with similar background and arriving at with solutions like data validation, data scraping (especially web scraping), data wrangling. CO3 PO3 The real world application study of RE will help to design and develop solutions of similar kind engineering problems Like Regular expressions are used in web programming and in other pattern matching situations CO3 PO4 Study of Regular expressions with examples will help in conducting detailed investigation of complex engineering problems. Like lexical parsers for programming languages can be expressed and implemented using regular expressions CO3 PO5 No tool is used so no mapping. CO3 PO6 Not helpful in health ,safety & societal considerations so no mapping.	<u> </u>	POo	Student will develop individual knowledge to work in a team or			
CO2 PO10 No soft skills no mapping. CO2 PO11 No management principles no mapping. CO2 PO12 Study of automata theory is required if students want to work in system based companies. CO3 PO1 The knowledge of regular expressions will help the students to apply the same to formulate solutions for engineering problems.like search engines.string processing .natural language processing.Al CO3 PO2 Correlating the study of automata to real world applications will aid in formulating engineering problems with similar background and arriving at with solutions like data validation, data scraping (especially web scraping). data wrangling. CO3 PO3 The real world application study of RE will help to design and develop solutions of similar kind engineering problems Like Regular expressions are used in web programming and in other pattern matching situations CO3 PO4 Study of Regular expressions with examples will help in conducting detailed investigation of complex engineering problems. Like lexical parsers for programming languages can be expressed and implemented using regular expressions CO3 PO5 No tool is used so no mapping. CO3 PO6 Not helpful in health ,safety & societal considerations so no mapping. CO3 PO4 Not contains environmental context so no mapping.		1 Og	individually			
CO2 PO11 No management principles no mapping. CO2 PO12 Study of automata theory is required if students want to work in system based companies. CO3 PO1 The knowledge of regular expressions will help the students to apply the same to formulate solutions for engineering problems.like search engines.string processing .natural language processing.Al CO3 PO2 Correlating the study of automata to real world applications will aid in formulating engineering problems with similar background and arriving at with solutions like data validation, data scraping (especially web scraping), data wrangling. CO3 PO3 The real world application study of RE will help to design and develop solutions of similar kind engineering problems. Like Regular expressions are used in web programming and in other pattern matching situations CO3 PO4 Study of Regular expressions with examples will help in conducting detailed investigation of complex engineering problems. Like lexical parsers for programming languages can be expressed and implemented using regular expressions CO3 PO5 No tool is used so no mapping. CO3 PO5 No tool is used so no mapping. CO3 PO5 Not contains environmental context so no mapping.	C:02	PO10	No soft skills no mapping			
CO2 PO12 Study of automata theory is required if students want to work in system based companies. CO3 PO1 The knowledge of regular expressions will help the students to apply the same to formulate solutions for engineering problems.like search engines.string processing ,natural language processing.Al CO3 PO2 Correlating the study of automata to real world applications will aid in formulating engineering problems with similar background and arriving at with solutions like data validation, data scraping (especially web scraping), data wrangling. CO3 PO3 The real world application study of RE will help to design and develop solutions of similar kind engineering problems Like Regular expressions are used in web programming and in other pattern matching situations CO3 PO4 Study of Regular expressions with examples will help in conducting detailed investigation of complex engineering problems. Like lexical parsers for programming languages can be expressed and implemented using regular expressions CO3 PO5 No tool is used so no mapping. CO3 PO6 Not helpful in health ,safety & societal considerations so no mapping.	CO2	PO11	No management principles no mapping			
CO3PO1State of the second companiesCO3PO1The knowledge of regular expressions will help the students to apply the same to formulate solutions for engineering problems.like search engines,string processing inatural language processing.AlCO3PO2Correlating the study of automata to real world applications will aid in formulating engineering problems with similar background and arriving at with solutions like data validation, data scraping (especially web scraping), data wrangling.CO3PO3The real world application study of RE will help to design and develop solutions of similar kind engineering problems Like Regular expressions are used in web programming and in other pattern matching situationsCO3PO4Study of Regular expressions with examples will help in conducting detailed investigation of complex engineering problems. Like lexical parsers for programming languages can be expressed and implemented using regular expressionsCO3PO5No tool is used so no mapping.CO3PO6Not helpful in health isafety & societal considerations so no mapping.CO3PO7Not contains environmental context so no mapping.	CO2	PO12	Study of automata theory is required if students want to work in			
CO3PO1The knowledge of regular expressions will help the students to apply the same to formulate solutions for engineering problems.like search engines,string processing ,natural language processing,AlCO3PO2Correlating the study of automata to real world applications will aid in formulating engineering problems with similar background and arriving at with solutions like data validation, data scraping (especially web scraping), data wrangling.CO3PO3The real world application study of RE will help to design and develop solutions of similar kind engineering problems Like Regular expressions are used in web programming and in other pattern matching situationsCO3PO4Study of Regular expressions with examples will help in conducting detailed investigation of complex engineering problems. Like lexical parsers for programming languages can be expressed and implemented using regular expressionsCO3PO5No tool is used so no mapping.CO3PO6Not helpful in health ,safety & societal considerations so no mapping.CO3PO7Not contains environmental context so no mapping.	002	1 012	system based companies.			
Apply the same to formulate solutions for engineering problems.like search engines,string processing ,natural language processing,AlCO3PO2Correlating the study of automata to real world applications will aid in formulating engineering problems with similar background and arriving at with solutions like data validation, data scraping (especially web scraping), data wrangling,CO3PO3The real world application study of RE will help to design and develop solutions of similar kind engineering problems Like Regular expressions are used in web programming and in other pattern matching situationsCO3PO4Study of Regular expressions with examples will help in conducting detailed investigation of complex engineering problems. Like lexical parsers for programming languages can be expressed and implemented using regular expressionsCO3PO5No tool is used so no mapping.CO3PO6Not helpful in health ,safety & societal considerations so no mapping.CO3PO7Not contains environmental context so no mapping.	CO3	PO1	The knowledge of regular expressions will help the students to			
Search engines, string processing , natural language processing, AlCO3PO2Correlating the study of automata to real world applications will aid in formulating engineering problems with similar background and arriving at with solutions like data validation, data scraping (especially web scraping), data wrangling,CO3PO3The real world application study of RE will help to design and develop solutions of similar kind engineering problems Like Regular expressions are used in web programming and in other pattern matching situationsCO3PO4Study of Regular expressions with examples will help in conducting detailed investigation of complex engineering problems. Like lexical parsers for programming languages can be expressed and implemented using regular expressionsCO3PO5No tool is used so no mapping.CO3PO6Not helpful in health ,safety & societal considerations so no mapping.CO3PO7Not contains environmental context so no mapping.			apply the same to formulate solutions for engineering problems	like		
CO3PO2Correlating the study of automata to real world applications will aid in formulating engineering problems with similar background and arriving at with solutions like data validation, data scraping (especially web scraping), data wrangling,CO3PO3The real world application study of RE will help to design and develop solutions of similar kind engineering problems Like Regular expressions are used in web programming and in other pattern matching situationsCO3PO4Study of Regular expressions with examples will help in conducting detailed investigation of complex engineering problems. Like lexical parsers for programming languages can be expressed and implemented using regular expressionsCO3PO5No tool is used so no mapping.CO3PO6Not helpful in health ,safety & societal considerations so no mapping.CO3PO7Not contains environmental context so no mapping.			search engines, string processing , natural language processing, A	AI		
in formulating engineering problems with similar background and arriving at with solutions like data validation, data scraping (especially web scraping), data wrangling,CO3PO3The real world application study of RE will help to design and develop solutions of similar kind engineering problems Like Regular expressions are used in web programming and in other pattern matching situationsCO3PO4Study of Regular expressions with examples will help in conducting detailed investigation of complex engineering problems. Like lexical parsers for programming languages can be expressed and implemented using regular expressionsCO3PO5No tool is used so no mapping.CO3PO6Not helpful in health ,safety & societal considerations so no mapping.CO3PO7Not contains environmental context so no mapping.	CO3	PO2	Correlating the study of automata to real world applications will	aid		
arriving at with solutions like data validation, data scraping (especially web scraping), data wrangling,CO3PO3The real world application study of RE will help to design and develop solutions of similar kind engineering problems Like Regular expressions are used in web programming and in other pattern matching situationsCO3PO4Study of Regular expressions with examples will help in conducting detailed investigation of complex engineering problems. Like lexical parsers for programming languages can be expressed and implemented using regular expressionsCO3PO5No tool is used so no mapping.CO3PO6Not helpful in health ,safety & societal considerations so no mapping.CO3PO7Not contains environmental context so no mapping.			in formulating engineering problems with similar background an	ıd		
CO3PO3The real world application study of RE will help to design and develop solutions of similar kind engineering problems Like Regular expressions are used in web programming and in other pattern matching situationsCO3PO4Study of Regular expressions with examples will help in conducting detailed investigation of complex engineering problems. Like lexical parsers for programming languages can be expressed and implemented using regular expressionsCO3PO5No tool is used so no mapping.CO3PO6Not helpful in health ,safety & societal considerations so no mapping.CO3PO7Not contains environmental context so no mapping.			arriving at with solutions like data validation, data scraping			
CO3PO3The real world application study of RE will help to design and develop solutions of similar kind engineering problems Like Regular expressions are used in web programming and in other pattern matching situationsCO3PO4Study of Regular expressions with examples will help in conducting detailed investigation of complex engineering problems. Like lexical parsers for programming languages can be expressed and implemented using regular expressionsCO3PO5No tool is used so no mapping.CO3PO6Not helpful in health ,safety & societal considerations so no mapping.CO3PO7Not contains environmental context so no mapping.			(especially web scraping), data wrangling,			
develop solutions of similar kind engineering problems Like Regular expressions are used in web programming and in other pattern matching situationsCO3PO4Study of Regular expressions with examples will help in conducting detailed investigation of complex engineering problems. Like lexical parsers for programming languages can be expressed and implemented using regular expressionsCO3PO5No tool is used so no mapping.CO3PO6Not helpful in health ,safety & societal considerations so no mapping.CO3PO7Not contains environmental context so no mapping.	CO3	PO3	The real world application study of RE will help to design and			
Expressions are used in web programming and in other pattern matching situationsCO3PO4Study of Regular expressions with examples will help in conducting detailed investigation of complex engineering problems. Like lexical parsers for programming languages can be expressed and implemented using regular expressionsCO3PO5No tool is used so no mapping.CO3PO6Not helpful in health ,safety & societal considerations so no mapping.CO3PO7Not contains environmental context so no mapping.			develop solutions of similar kind engineering problems Like Reg	jular		
CO3 PO4 Study of Regular expressions with examples will help in conducting detailed investigation of complex engineering problems. Like lexical parsers for programming languages can be expressed and implemented using regular expressions CO3 PO5 No tool is used so no mapping. CO3 PO6 Not helpful in health ,safety & societal considerations so no mapping. CO3 PO7 Not contains environmental context so no mapping.			expressions are used in web programming and in other pattern			
CO3 PO4 Study of Regular expressions with examples with help in conducting detailed investigation of complex engineering problems. Like lexical parsers for programming languages can be expressed and implemented using regular expressions CO3 PO5 No tool is used so no mapping. CO3 PO6 Not helpful in health ,safety & societal considerations so no mapping. CO3 PO7 Not contains environmental context so no mapping.			That in the studious	sting		
CO3 PO5 No tool is used so no mapping. CO3 PO6 Not helpful in health ,safety & societal considerations so no mapping. CO3 PO7 Not contains environmental context so no mapping.	03	P04	detailed investigation of complex angineering problems. Like	Jung		
implemented using regular expressions CO3 PO5 No tool is used so no mapping. CO3 PO6 Not helpful in health ,safety & societal considerations so no mapping. CO3 PO7 Not contains environmental context so no mapping.			lexical parsers for programming languages can be expressed an	nd		
CO3 PO5 No tool is used so no mapping. CO3 PO6 Not helpful in health ,safety & societal considerations so no mapping. CO3 PO7 Not contains environmental context so no mapping.			implemented using regular expressions	·~		
CO3 PO6 Not helpful in health ,safety & societal considerations so no mapping. CO3 PO7 Not contains environmental context so no mapping.	503	PO5	No tool is used so no mapping.			
CO3 PO7 Not contains environmental context so no mapping.	CO3	P06	Not helpful in health safety & societal considerations so no			
CO3 PO7 Not contains environmental context so no mapping.			mapping.			
	CO3	PO7	Not contains environmental context so no mapping.			

Logo	SKIT	Teaching Process	Rev No.: 1.0
	Doc Code:	INST.Ph5b1.F02	Date: 3-08-2018
A CONTRACTOR	Title:	Course Plan	Page: 9 / 29
Copyright ©2017. cA	AS. All rights reserved		
CO3	PO8	No ethical principles no mapping.	
CO3	PO9	Student will develop individual knowledge to work in a tean individually.	nor
CO3	PO10	No soft skills no mapping.	
CO3	PO11	No management principles no mapping.	
CO3	PO12	Study of regular expression is required if students want to w	vork in
		system as well as software based companies.for example if want to build new search engine.	they
CO4	PO1	The knowledge of regular grammar will help the students to	apply
		the same to formulate solutions for engineering problems.L	ike
CO4	PO2	Detailed analytical and evaluative study of automata with he	elp in
004	1.02	identification, formulation and finding feasible solutions for r world computational problems.	eal
CO4	PO3	An evaluative knowledge of automata will help in applying t	he
		same while designing and developing solutions to computa problems	tional
CO4	PO4	Evaluative learning of different type of automata will help in	analysis
		and synthesis of real time computational problems.	
CO4	PO5	No tool content so no mapping	
CO4	PO6	By understanding regular grammar students can apply co	ntextual
		knowledge to assess solution to complex engineering prob	lems
		which may be helpful in health ,safety & societal considerat	ons for
		example Neural networks, Multi functional Radar construction	on.
C04	P0/	Not contains environmental context so no mapping.	
<u> </u>	P06	No etnical principles no mapping. Student will develop individual knowledge to work in a team	a or
04	POg	individually	1 Or
CO4	PO10	No soft skills no mapping.	
CO4	PO11	No management principles no mapping.	
CO4	PO12	Study of automata theory is required if students want to wo	rk in
		system based companies.	
CO5	PO1	Understanding the different categories of basic computation	nal
		problems will aid in applying the knowledge to find solution	s of
		complex problems like CFG parsing for high speed network	<
		applications, Natural language processing.	
05	PO2	Different computational problems can be identified, formula	ted,
		the basic computational problems like Natural language pro	are or
		Human activities recognition.	Jeessing,
CO5	PO3	Complexity study of the basic computational problems will	help in
		design and development of solutions for real time computa	tional
		problems. For example Human activities recognition, Neura	L
		networks.	
CO5	PO4	Study of CFG with examples will help in conducting detaile	d
		investigation of complex engineering problems.For example	e Human
		activities recognition, Neural networks, Multi functional Radi	ar
		Construction.	
	P05	Ry understanding CEC students can apply contextual know	lodgo to
		assess solution to complex engineering problems which m	av he
		helpful in health safety & societal considerations. Like It is	used for
		Artificial Intelligence as part of making machines more intell	igent, to
		understand better the languages and be more efficient & A	tificial
		Intelligence is widely used in healthcare, Entertainment, finar	nce etc,
		Data processing.	

Logo	SKIT	Teaching Process	Rev No.: 1.0
	Doc Code:	INST.Ph5b1.F02	Date: 3-08-2018
	Title:	Course Plan	Page: 10 / 29
Copyright ©2017. cA	AS. All rights reserved	<u> </u>	
CO5	PO7	Thorough understanding CFG theory they can know the	
		environmental contexts for example Human behavior recog	Inition
		using a context-free grammar.	
CO5	PO8	No ethical principles no mapping.	
CO5	PO9	Student will develop individual knowledge to work in a tean	n or
		individually.	
CO5	PO10	No soft skills no mapping.	
CO5	PO11	No management principles no mapping.	
CO5	PO12	Study of CFG is required if students want to work in system	as well
		as software based companies. For example if they want to b	puild
		Human behavior recognition using a context-free grammar	is still a
		challenging problem due to many reasons, including limited	
		accuracy of the data acquired by sensing devices.	
CO6	PO1	Understanding the different categories of basic computation	nal
		problems will aid in applying the knowledge to find solution	SOF
		complex problems like CFG parsing for high speed network	(
	DO0	applications, Natural language processing.	analyza
000	P02	engineering problems	anatyze
C06	PO2	Thorough understanding of different types of automata will	help in
	103	the design and development of abstract models for compu-	tational
		problems	
C06	PO4	Study of automata with examples will help in conducting de	tailed
		investigation of complex engineering problems.	
CO6	PO5	No tool content so no mapping.	
CO6	PO6	By understanding CFG students can apply contextual know	/ledge to
		assess solution to complex engineering problems which m	nay be
		helpful in health ,safety & societal considerations. Like It is u	used for
		Artificial Intelligence as part of making machines more intell	igent, to
		understand better the languages and be more efficient & A	rtificial
		Intelligence is widely used in healthcare, Entertainment, finar	nce etc,
		Data processing.	
CO6	P07	Thorough understanding CFG theory they can know the	
		environmental contexts for example Human benavior recog	Inition
		Using a context-free grammar.	
<u> </u>	POo	No etnical principles no mapping. Student will develop individual knowledge to work in a team	
000	POg	individually	I OI
	PO10	No soft skills no mapping	
C00	PO11	No soft skills no mapping.	
C00	PO12	Study of PDA is required if students want to work in system	
000	1012	as software based companies. For example if they want to k	nild
		Human behavior recognition using a context-free grammar	is still a
		challenging problem due to many reasons, including limited	1
		accuracy of the data acquired by sensing devices.	
CO7	PO1	The knowledge of pumping lemma will help the students to	apply
		the same to formulate solutions for engineering problems.L	ike
		natural language processing,AI.	
CO7	PO2	Detailed analytical and evaluative study of automata with he	əlp in
		identification, formulation and finding feasible solutions for r	eal
		world computational problems.	
C07	PO3	An evaluative knowledge of automata will help in applying	he
		same while designing and developing solutions to computa	tional
		problems.	
CO7	PO4	Evaluative learning of different type of automata will help in	analysis
		and synthesis of real time computational problems.	

Logo	SKIT	Teaching Process	Rev No.: 1.0
	Doc Code:	INST.Ph5b1.F02	Date: 3-08-2018
	Title:	Course Plan	Page: 11 / 29
Copyright ©2017. cA	AS. All rights reserved		
CO7	PO5	No tool content so no mapping.	
CO7	PO6	By understanding pumping lemma students can apply cor knowledge to assess solution to complex engineering prob which may be helpful in health ,safety & societal considerat example Neural networks, Multi functional Radar constructi	ntextual blems ions for on.
CO7	PO7	No environmental context so no mapping.	
C07	PO8	No ethical principles no mapping.	
C07	PO9	Student will develop individual knowledge to work in a tear individually.	n or
CO7	PO10	No soft skills no mapping.	
C07	PO11	No management principles no mapping.	
CO7	PO12	Study of automata theory is required if students want to wo system based companies.	rk in
CO8	PO1	Understanding the different categories of basic computation problems will aid in applying the knowledge to find solution complex problems	nal Is of
CO8	PO2	The knowledge of mathematical principles and turing mach help the students to apply the same to identify and analyze engineering problems. Like how efficiently problems can be on a model of computation. To which extent a problem is so on a computer.	hine will e solved blvable
CO8	PO3	Complexity study of the basic computational problems will design and development of solutions for real time computa problems	help in tional
CO8	PO4	Study of computational problems and their associated com will help to provide valid conclusions of real time computati problems	plexity ional
CO8	PO5	No tool content so no mapping.	
CO8	PO6	By understanding turing machine students can apply conte knowledge to assess solution to complex engineering prob which may be helpful in health ,safety & societal considerat Like It is used for Artificial Intelligence as part of making ma more intelligent, to understand better the languages and be efficient & Artificial Intelligence is widely used in health care,Entertainment,finance etc, Data processing.	extual olems ions. achines e more
CO8	PO7	Thorough understanding turing machine theory they can k environmental contexts for example Human behavior recog using a context-free grammar.	now the gnition
CO8	PO8	No ethical principles no mapping.	
CO8	PO9	Student will develop individual knowledge to work in a tear individually.	n or
CO8	PO10	No soft skills no mapping.	
CO8	PO11	No management principles no mapping.	
CO8	PO12	Study of turing machine is required if students want to work system as well as software based companies. For example want to build Human behavior recognition using a context-f grammar is still a challenging problem due to many reasons including limited accuracy of the data acquired by sensing o	k in if they Free s, devices.
CO9	PO1	Understanding the different categories of basic computation problems will aid in applying the knowledge to find solution complex problems	nal Is of
CO9	PO2	Different computational problems can be identified, formula reviewed and conclusions can be reached, when we are aw the basic computational problems	ated, vare of
CO9	PO3	Complexity study of the basic computational problems will design and development of solutions for real time computa	help in tional

Logo	SKIT	SKIT Teaching Process Rev No.:		
	Doc Code:	INST.Ph5b1.F02	Date: 3-08-2018	
A CO	Title:	Course Plan	Page: 12 / 29	
Copyright ©2017. cA	AS. All rights reserved	1 3.		
		problems		
CO9	PO4	Study of computational problems and their associated com	plexity	
		will help to provide valid conclusions of real time computat	ional	
		proplems		
C09	P05	No tool content so no mapping.		
09	P06	By understanding turing machine students can apply conte	extual	
		which may be helpful in health, cafety & secietal considerat	ions	
		like It is used for Artificial Intelligence as part of making ma	ions. Achines	
		more intelligent to understand better the languages and be	more	
		efficient & Artificial Intelligence is widely used in health		
		care,Entertainment,finance etc, Data processing.		
CO9	PO7	Thorough understanding turing machine theory they can k	now the	
		environmental contexts for example Human behavior recog	gnition	
		using a context-free grammar.		
CO9	PO8	No ethical principles no mapping.		
CO9	PO9	Student will develop individual knowledge to work in a tear	n or	
		individually.		
CO9	PO10	No soft skills no mapping.		
COg	PO11	No management principles no mapping.		
CO9	PO12	Study of turing machine is required if students want to work	(in	
		system as well as software based companies. For example	If they	
		arapmar is still a challonging problem due to many reason	ree	
		including limited accuracy of the data acquired by sensing (s, devices	
CO10	PO1	The knowledge of mathematical principles will help the stu	dents to	
		apply the same to formulate solutions for engineering prob	lems.like	
		designing compilers,natural language processing,AI		
CO10	PO2	Understanding of different automata will help to review and	l analyze	
		engineering problems.	-	
CO10	PO3	Complexity study of the basic computational problems will	help in	
		design and development of solutions for real time computa	Itional	
		problems		
CO10	PO4	I horough understanding of different types of automata will	help in	
		the design and development of abstract models for compu	tational	
CO10	DOr	problems. No tool content so no manping		
CO10	PO5	Ry understanding linear bound automata students can an		
010	FUU	contextual knowledge to assess solution to complex engine	eerina	
		problems which may be helpful in health safety & societal	cering	
		considerations for example Neural networks. Multi function	al Radar	
		construction.		
CO10	PO7	No environmental context so no mapping.		
CO10	PO8	No ethical principles no mapping.		
CO10	PO9	Student will develop individual knowledge to work in a tear	n or	
		individually.		
CO10	PO10	No soft skills no mapping.		
CO10	PO11	No management principles no mapping.		
CO10	PO12	Study of automata theory is required if students want to wo	rk in	
		system based companies.		

Note: Write justification for each CO-PO mapping.

5. Curricular Gap and Content

SNo	Gap Topic	Actions Planned	Schedule Planned	Resources Person	PO Mapping
1					

Lo	go SKIT		Teaching Process		Rev No.: 1.0				
12		Doc Code:	INST	NST.Ph5b1.F02			Date	Date: 3-08-2018	
Contraction of the second seco	Title:		Cour	Course Plan			Page: 13 / 29		
Copyright	©2017. c/	AS. All rights reserved							
2									
3									
4									
5									

Note: Write Gap topics from A.4 and add others also.

6. Content Beyond Syllabus

SNo	Gap Topic	Actions Planned	Schedule Planned	Resources Person	PO Mapping
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

Note: Anything not covered above is included here.

C. COURSE ASSESSMENT

1. Course Coverage

Mod	Title	Teaching		No. of	f quest	ion in	Exam		СО	Levels
ule		Hours	CIA-1	CIA-2	CIA-3	Asg	Extra	SEE		
#							Asg			
1	Introduction to the concept of	10	2	-	-	1	1	2	CO1,	L2,L4
	automata theory & Finite state								CO2	
	Machine.									
2	Regular expressions & Regular	10	2	-	-	1	1	2	CO3,	L3, L4
	grammar,Regular Language								CO4	
3	Context free grammar & Push down	10	-	2	-	1	1	2	CO5,	L4, L4
	automata								CO6	
4	Context free languages & Turing	10	-	2	2	1	1	2	CO7,	L3, L4
	machine								C08	
5	Multi tape turing machine & Linear	10	-	-	2	1	1	2	CO9,	L2, L3
	bounded automata.								CO10	
-	Total	50	4	4	4	5	5	10	-	-

Note: Distinct assignment for each student. 1 Assignment per chapter per student. 1 seminar per test per student.

2. Continuous Internal Assessment (CIA)

Evaluation	Weightage in Marks	СО	Levels
CIA Exam – 1	15	CO1, CO2, CO3, CO4	L2,L4,L3,L4
CIA Exam – 2	15	CO5, CO6, CO7, Co8	L4,L4,L3,L4
CIA Exam – 3	15	CO9, CO10	L3,L2,L3

Logo	SKIT	Teacl	Teaching Process			
	Doc Code:	INST.Ph5b1.F02		Date: 3-08-2018		
	Title:	Course Plan		Page: 14 / 29		
Copyright ©2017. c	AS. All rights reserved	· ·				
Assignment - 1		05	CO1, CO2, CO3, CO4	L2,L4,L3,L4		
Assignment	2	05	CO5, CO6, CO7, CO8	L4,L4,L3,L4		
Assignment	:-3	05	CO9, CO10	L3,L2,L3		
Seminar - 1						
Seminar - 2						
Seminar - 3						
Other Activities – define -		_	CO1 to Co9	L2, L3, L4		
Slip test						
Final C	IA Marks	20	-	-		

Note : Blooms Level in last column shall match with A.2 above.

D1. TEACHING PLAN - 1

Module - 1

Title:	ntroduction to the concept of automata theory Finite state machine.	Appr Time:	16 Hrs
a	Course Outcomes	-	Blooms
_	The student should be able to:	-	Level
1	Understand the Core Concepts Of Automata Theory.	CO1	L2
2	Design ,Translate Between Different abstract state	CO2	L4
	machine(e.g:deterministic,Non-Deterministic)		-
b	Course Schedule	-	-
Class No	Module Content Covered	СО	Level
1	Why study the Theory of Computation, Languages and Strings: Strings,Languages.	C01	L2
2	A Language Hierarchy, Computation, Finite State Machines(FSM): Deterministic FSM	CO2	L4
3	A Language Hierarchy, Computation, Finite State Machines(FSM): Deterministic FSM	CO2	L4
4	Regular languages, Designing FSM,Nondeterministic FSMs.	CO2	L4
5	Regular languages, Designing FSM,Nondeterministic FSMs.	CO2	L4
6	From FSMs to Operational Systems.	CO2	L4
7	Simulators for FSMs.	CO2	L4
8	Minimizing FSMs.	CO2	L4
9	Canonical form of Regular languages.	CO2	L4
10	Finite State Transducers, Bidirectional Transducers.	CO2	L4
	Application Areas	<u> </u>	Loval
C	Application Areas		Level
	theory.	001	L2
2	commonly used to build software applications with finite state machines: Automata-based programming.		L4
d	Review Questions	-	_
1	What is the use of studying Theory of Computation?	CO1	L2
2	With example define i) String ii) Alphabet ii) Length of string iii)	CO1	L2
CS			

Logo	SKIT	Teaching Process	Rev No	D.: 1.0
100	Doc Code:	INST.Ph5b1.F02	Date: 3	-08-2018
	Title:	Course Plan	Page: 1	15 / 29
Copyright ©201	7. cAAS. All rights reserved.			
3	Define Languag	es and Functions over languages	CO1	L2
4	Define DFSM an	Regular language with example.	CO1	L2
5	Explain the diffe	rence between DFSM and NDFSM.	CO2	L4
6	Build a determine belonging to the for the strings list a) L = {w \in {a, b}* b) L = {w \in {a, b}* c) L = {w \in {a, b}* d) L = {w \in {a, b}* e) L = {w \in {a, b}* f) L = {w \in {0, 1}* f) L = {w \in {0, 1}*	histic FSM for each of the following languages. List a string a L and a string not belonging to L. Give the configurations sted. : every a in w is immediately preceded & followed by b} : w does not end in ba]. : w has bbab as a substring]. : w has neither ab nor bb as a substring]. : w is of even length and begins with 01]. strings such that number of 1's is even and the number	CO2	L4
7	Build a determin a) L = {w \in {0, 1}* leading 0's, of n b) L = {w \in {0, 1} o's, of natural nu c) L = {w \in {0, 1}* d) L = {w \in {0, 1}* d) L = {w \in {0, 1}* d) L = {w \in {0, 1}* e) L = {w \in {0, 1}* followed by a's} f) The set of bina most one pair of g) L = {w \in {a, b}* h)L = {w \in {a, b}* i)L = {w \in {a, b}* i)L = {w \in {a, b}* k)L = {w \in {a, b}* i)L = {w \in {a, c}*	histic FSM for each of the following languages. : w corresponds to the binary encoding, without atural numbers that are evenly divisible by 4]. * : w corresponds to the binary encoding, without leading umbers that are powers of 4]. : w has 001 as a substring]. : w does not have 001 as a substring]. : w contains at least two b's that are not immediately ary strings with at most one pair of consecutive 0's and at f consecutive 1's. : $ w = 5 \circ$] : $ w mod 3 = 0$] In w, 4th character from last is a] w is not ending with abb]. all strings with at least one 'a' and exactly two 'b's] all five vowels occur in w in alphabetical order] : w has both aa and bb as a substrings]. 1, j≥1] strings represented in binary, that are divisible by 4	CO2	L4
8	Define NDFSM \	with example.	CO1	L2
<u> </u>				

	$O/L = I \otimes C [O, 1]$. Stillings represented in binding, that are divisible by 4		
	p)L = {w \in {0-9}* : strings represented in decimal, that are divisible by 3		
8	Define NDFSM with example.	CO1	L2
9	Give the difference between DFSM and FSM	CO2	L4
10	 Design Non-Deterministic FSM for the following languages a) L = {w ∈ {a - z}* : all five vowels a, e, i o, and u occur in w in alphabetical order} 5 b) L = {w {a, b}* : w is made up of an optional a followed by aa followed by zero or more b's}. c) L = {w {a, b}* : w = aba or w is even}. d) L = {w {a, b, c}* : _x, y {a, b, c}* (w = x abcabb y)}. e) L = {w {a, b}* : the fourth to the last character is a} f) Σ={a, b, c, d}, L = {w : there is a symbol a 1 Σ not appearing in w} 	CO2	L4
е	Experiences	-	-
1		CO1	L2
2			
3			
4		CO3	L3
5			

Module – 2

	Title:	Regular expressions & Regular grammar,Regular Language	Appr	10 Hrs
--	--------	--	------	--------

Logo	
Copyright ©2017. c	Α.

	SKIT	Teaching Process	Rev No.:	1.0				
$\langle \mathbf{n} \rangle$	Doc Code:	INST.Ph5b1.F02	Date: 3-0	8-2018				
9	Title:	Course Plan	Page: 16	/ 29				
017. C	17. cAAS. All rights reserved.							

and the second s				
opyright ©2017	. cAA	S. All	rights	reserve

		Time:	
a	Course Outcomes	-	Blooms
-		-	Level
1	Build, convert Regular expression to Finite State machine using kleen's theorem to achieve pattern matching	CO3	L3
2	Construct regular grammar to accept regular language.	CO4	L4
D Class Na	Course Schedule	-	-
	Module Content Covered		Level
	Regular Expressions (RE). What is a RE?, Rieene's theorem	003	L2
12	Applications of REs.	CO3	L2
13	Manipulating and Simplifying REs	CO3	L3
14	Regular Grammars: Definition,Regular Grammars and Regular languages	CO4	L3
15	Regular Languages (RL) and Nonregular Languages: How many RLs,	CO4	L4
16	Regular Languages (RL) and Nonregular Languages: How many RLs,	CO4	L2
17	To show that a language is regular	CO4	L4
18	Closure properties of RLs	CO4	L3
19	To show some languages are not RLs	CO4	L4
20	To show some languages are not RLs	CO4	L4
-	Application Areas	0	
	Regular expressions are useful in a wide variety of text processing	 	
	tasks,simple parsing, useful on Internet search engines.		
2	become knowledgeable about restricted models of computation.	CO4	L4
d	Review Questions	-	-
12	Write R.E for the following language 1)L={a²nb²m n>=0,m>=0} 2)L={w: w mod3=0 where w & (a,b)*} 3)L={u v u: u,v & (a,b)* & v =2}	CO3	L1
13	Construct an fsm for the following Regular Expression 1)(b+ab)* 2)a*+b*+c*	CO4	L3
14	State and prove pumping lemma for non regular languages	CO3	L2
15	Show a regular language for each of the following languages 1)L={w E {a,b}*:w contains the substring abb} 2)L={w E {a,b}*:w does not end in aa}	CO4	L4
16	Prove that regular languages are closed under difference,complement & intersection.	CO4	L2
17	Show that following languages are not regular	CO3	L4
18	1)L=Ia ^{··} D ^{··} IN>=0} 2)L=IWW ^{··} IW & (0,1) Write algoritm fsmtoregexheuristic() and fsmtoregex() to obtain R.E from	CO3	L2
	FSM		
e	Experiences		_
1		CO1	L2
2			
3			
4		CO3	L3

CS

Logo	SKIT	Teaching Process	Rev No.: 1.0						
	Doc Code:	le: INST.Ph5b1.F02 Da		08-2018					
	Title:	Course Plan	Page: 17 / 29						
Copyright ©2017	Copyright ©2017. cAAS. All rights reserved.								
5									

E1. CIA EXAM – 1

a. Model Question Paper - 1

Crs (Code:	15CS54	Sem:	V	Marks:	30	Time:	75 minute	minutes	
Cour	rse:	Automata ⁻	Theory & C	Computabi	ility					
-	-	Note: Ansv	ver any 3 d	questions,	, each carry e	qual mar	ks.	Marks	СО	Level
1	а	Define DFS 1.L={Havinc	SM & NDFS even no.c	M.Design of a's and e	DFSM for the even no.of b's}	e followin	g languages	5	CO1	L1,L4
	b	Design ND	, FSM for th	e followin	g languages			5	CO2	L4
		1.L={w:wlab	ab ⁿ or aba	where n	>=O}					
		2.L={w is made up of an optional a followed by aa followed by zero o more b's} Build a deterministic ESM for each of the following languages								
	С	Build a det	erministic	FSM for ea	ach of the foll	owing lar	iguages.	5	CO2	L4
		$a.L = \{w \in \{c\}\}$), 1}* : w ha	s 001 as a	substring}.					
		b) L = {w ∈ {	0, 1}* : w de	pes not ha	ive 001 as a su	ubstring}.				
2	a	Find the ec	nuivalence	DESM for	the following	NDESM		5	<u> </u>	
			alvateriee	DISPINO	the rotto wing			5	OOL	
			-2	70 - E	• (q1) • •					
				1 .	1 0	1				
		a, b q_0 a q_1 a, b q_2 a, b q_3 a, b q_4								
		6	\sim							
			b e	a	a	ь	a			
			(q3)-	ь	аз в		15			
					a (c)					
	h	Provo that	lff the land		acconted by		than thara avists	20 E	<u> </u>	
		equivalent	DFSM.	Juage L IS	accepted by				002	L4
	С	Minimize tł	ne followin	g DFSM				5	CO2	L4
			(q_1)	a (a					
					a					
			b b	b	b	b b				
				(a	*				
			q_4	a >	<i>q</i> ₅ → a	q_6				
3	а	Write R.E fo	or the follo	wing lang	luage			5	CO3	L4
	h	$1)L=\{a^{-1}D^{-1}\}$	n>=0,m>=0	2)L={W: V		ere w č (a	1 (0,		<u> </u>	
		L={u v u: u.v	/ E (a.b)* &	v =2}	luage			5	003	
	С	Construct a	an fsm for	the follow	ing Regular E	xpression	l	5	CO3	L4
		1)(b+ab)*	2)a*+b*+c*			•				
4	a	State and p	prove pum	ping lemn	na for non reg	ular lang	uages	5	CO3	L2
	b	how a regu	Ilar langua	ge for eac	ch of the follo	wing lang	uages	5	CO4	L4
		コンニ=いい と (a,	bl .w CONta	not end in	n aal					
	C	Show that	following l	anguages	are not regula	ar		5	COA	
		1)L={an bn r	1>=0}	2)	$L=\{wwR w \in (0)$,1)*				

b. Assignment -1

Note: A distinct assignment to be assigned to each student.

Lo	Logo SKIT Teaching Process			Rev No.: 1.0					
12	Doc Code: INST.Ph5b1.F02		Date: 3-08-2018		2018				
Children and and and and and and and and and an		Title: Course Plan				e: 18 / 2	9		
Copyright	t ©2017. C	AAS. All rights	reserved.						
				Model Assignment Questions					
Crs C	ode:	<u>15CS54</u>	Sen	n: v Marks: 5 lime: 90) – 120 i	minutes	5		
Cours		Automat	a The						
Note:	Each	student	to ans	wer 2-3 assignments. Each assignment carries equal mark	<. •	<u> </u>	1		
SINO		JSIN	Com	Assignment Description	marks		Level		
			all sta	tes. q_0 e q_1 o q_2 1 e 1					
			a,b	$\begin{array}{c} & & & \\ & & & \\ \hline q_{3} & & & \\ \hline q_{4} & & \\ \hline q_{6} & & \\ \hline q_{6} & & \\ \hline q_{6} & & \\ \hline q_{1} & & \\ \hline q_{1} & & \\ \hline q_{2} & & \\ \hline (b) & & \\ \hline \end{array}$					
				$\begin{array}{c c} & e & q_1 & a & q_4 & a \\ \hline & & & & & \\ & & & & & \\ & & & & & \\ & & & & & \\ & & & & & \\ & & & & & \\ & & & & & \\ & & & & & \\ & & & & & \\ & & & & & \\ & & & \\ & & & & \\ & & & \\ & & & & \\ & & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ &$					
			Dece	ibe the algorithm to minimize DECMs	_	CO1			
2			Desci Minim	ibe the algorithm to minimize DFSMs	5	CO1	2		
٢				$\begin{array}{c} \hline \\ \hline $	5	002	L4		
4			Define	e finite state transducers.	5	CO2	L2		
5			Expla	in Moore machine with example	5	CO2	L4		

D2. TEACHING PLAN - 2

Module – 3

Title:	Context free grammar & Push down automata	Appr	10 Hrs
		Time:	
a	Course Outcomes	-	Blooms
-	The student should be able to:	-	Level
1	Design ,simplify context free grammar for context free languages	CO5	L4
2	Analyze, construct Push down automata to accept context free grammar.	CO6	L4

CS

Logo	SKIT	Teaching Process	Rev No.: 1.0
	Doc Code:	INST.Ph5b1.F02	Date: 3-08-2018
	Title:	Course Plan	Page: 19 / 29

Copyright ©2017. cAAS. All rights reserved.

b	Course Schedule	-	-
Class No	Module Content Covered	CO	Level
21	Context-Free Grammars(CFG): Introduction to Rewrite Systems and	CO5	L2
	Grammars		
22	CEGs and languages, designing CEGs	CO5	14
			-+
23	simplifying CFGs, proving that a Grammar is correct	CO5	L4
24	Derivation and Parse trees	CO5	L4
25	Ambiguity	CO5	L4
26	Normal Forms	CO5	L4
27	Pushdown Automata (PDA) [,] Definition of non-deterministic PDA	CO6	2
	Deterministic and Non-deterministic PDAs		
28	Pushdown Automata (PDA): Definition of non-deterministic PDA,	CO6	L4
	Deterministic and Non-deterministic PDAs		
20	Non-determinism and Halting, alternative	C06	11
29	equivalent definitions of a PDA	000	-4
30	Alternatives that are not equivalent to PDA.	CO6	L4
С	Application Areas	CO	Level
1	Used to describe the structure of programming languages, In most	CO5	L4
	programming languages opening and closing of braces, curly brackets is		
	taken care		
2	Online transaction process system , Deterministic top down parsing .	006	L4
d	Peview Questions		
1	Define the following with example	COS	2
-	a. Rewrite system	005	
	b. Context Free Grammar		
	c. Recursive and self embedding grammar		
2	Write the CFG for following languages.	CO5	L4
	a. L= {a n b n n>=0 }		
	b. L= {a 2n b n n>=0 }		
	C. L= {a n b 2n n>=0 }		
	$d. L = \{a 2n p n n > 1\}$		
	$E = \{d \mid D \ge 1 \mid D > 1\}$ f = {a n h n+1 n>-0}		
	$\alpha = \{a n b n+2 n > = 0\}$		
	h. L= $\{a n+3 b n \mid n >= 1\}$		
	i. L= {a n+2 b n n>=1}		
	j. L = {a n b m : n ₊₌ m}		
	k. L = {a n b m : n a (w)>n b (w)}		
	L. L={ww R w ε{a,b}*}		
	m. L= $\{0 \text{ m } 1 \text{ m } 2 \text{ n} \text{m} > 1, \text{n} > 0\}$		
	$\begin{array}{c c} n. L = \{0 \mid 1 \} \mid _{L_{0}}, >=0, >=0\} \\ n. L = \{2, n, h, m, n\} = 0, m, n\} \\ n. L = \{2, n, h, m, n\} = 0, m, n\} \\ n. L = \{0, n, n\} = 0, m, n\} \\ n. L = \{0, n\} = 0, m, n\} \\ n. L = \{0, n\} = 0, m, n\} \\ n. L = \{0, n\} = 0, m, n\} \\ n. L = \{0, n\} = 0, m, n\} \\ n. L = \{0, n\} = 0, m, n\} \\ n. L = \{0, n\} = 0, m, n\} \\ n. L = \{0, n\} \\ n.$		
	$U_{L} = [a \cap U \cap (1, 1) = 0, (1, 2)]$ $u_{L} = [a \cap b \cap (2m - 1) = 0]$		
	$a = \{w w mod 3 = w mod 2 on \{a\}\}$		
	r. L={w: $ w \mod 3 >= w \mod 2 \text{ on } \{a\}$ }		
	s. L={a m b m c k n+2m=k for n>=0, m>=0}		
	t. No more than 3 a's on {a,b}		

Logo	SKIT	Teaching Process	Rev No.:	1.0
1200	Doc Code: IN	JST.Ph5b1.F02	Date: 3-08-2018	
C C C C C C C C C C C C C C C C C C C	Title: C	Page: 20	/ 29	
Copyright ©201	7. cAAS. All rights reserved.			
	u. strings of 0's an	nd 1's having substring '000'		
	v. strings of a's an	d b's starting with 'a' and ending with 'b'		
	w. strings of a's ar	nd b's whose length is multiple of 3.		
	x. L = la n b m : n a	a (w)>n b (w)+1		
3	Write the algorith	m removeunproductive(G) and removeunreachable(G).	CO5	L3
4	Simplify the follow	wing grammars:	CO5	L4
	DIS AD AC, A	\Box dA IDAdid, $D \Box$ DDAidDIAD, $C \Box$ dCdidD, $D \Box$ dDiDC	COF	
5	$P_{10} = 100 = 1$	005	L4	
6	Define the followi	20 J.	COF	12
	a Derivation	ng	005	LZ
	b. Left-Most Deriv	vation		
	c. Right-Most Deri	ivation		
	d. Parse Tree			
7	Obtain Left most (derivation (LMD) and Right most derivation (RMD) for the	CO5	L4
	string +*-xyxy usin	ng the grammar		
	E->_+EE *EE -EE	lxly		
8	Obtain LMD and F	RMD for id+id*id using 6	CO5	L4
9	Consider the CFG	i with productions	CO5	L4
	$E \rightarrow E^{+}T \mid T$			
	$T \to T^*F F $			
	$F \rightarrow (E) \mid 0 \mid 1$	and names tree for the string α ((4* α), α)		
		and parse tree for the string 0+((1 0)+0)		
10	E → E+E E E (E) Dofine the fellewri		COF	10
10	a Ambiguity	ng	005	LZ
	h Inherently ambi	quous grammar		
	c.Nullable variable	e		
	d.Useless symbol			
11	Show that the foll	owing grammars are ambiguous.	C05	L4
	a) S \rightarrow SbS a			
	b)S_→iCtS iCtSe	eS a, C_b		
12	Consider the gran	nmar: $S \rightarrow aS aSbS \epsilon$	CO5	L4
	Is the above gram	nmar ambiguous?		
	Show that the stri	ng "aab" has two -		
	ii) Loft most daring	ations		
	iii) Diaht most deriv	ivations		
12	list three structu	ires in CEG that lead to ambiguity. How to overcome	COS	2
L 13	these problems?	area in a char tead to ambiguity. Now to overcome	009	J
14	Remove ambiguit	y from following grammars.	CO5	L4
-'	a) S \rightarrow (S) SS	b) E →E+E E*E (E) id		
15	Define CNF and G	SNF.	CO5	L2
16	Convert each of t	the following grammars to Chomsky normal form.	CO5	L4
	a. $S \rightarrow aSa$	b. $S \rightarrow ABC$		
	$S \rightarrow B$	$A \rightarrow aC \mid D$		
	$B \rightarrow bbC$	$B \rightarrow DB \mid \varepsilon \mid A$ $C \rightarrow Ac \mid \varepsilon \mid Cc$		
	$C \rightarrow c$	$D \rightarrow aa$		
	$C \rightarrow cC$			
	c. $S \rightarrow aTVa$	Th e V		
	$V \rightarrow cVc \mid \varepsilon$			

Logo	SKIT	SKIT Teaching Process		
200	Doc Code:	INST.Ph5b1.F02	Date: 3-0	8-2018
C C	Title:	Course Plan	Page: 21	/ 29
Copyright ©2017	7. cAAS. All rights reserved	·		
17	Convert the foll	owing CFG to CNF.	CO5	L4
	a.	b. c.		
	$S \rightarrow aB \mid bA$	$S \rightarrow AB \mid a$ $S \rightarrow aBa \mid abba$		
	$ A \rightarrow a aS bA$	$A \qquad A \rightarrow ab$		
	$ B \rightarrow b aS aBE$	$B \rightarrow AC \qquad B \rightarrow aB \mid a$		
40	\V/vita ava alevavit	le vez f e v		
10	white an algorit		005	L3
	a. Terriovecps() h. atmostoneFr	ns()		
	c. removeUnits			
	d. removeMixed	d(G)		
	e. RemoveLong	J(G)		
19	Define a) PDA	b) Deterministic PDA c) Computation in PDA d) String	CO6	L2
	accept in PDA e	e) String reject in PDA		
20	Design PDA alo	ng with transition diagram for the following language:	CO6	L4
	L = {a n b n n >			
	Write the comp	utation (sequence of all configurations) for the input string		
21	Construct DDA	DD.	<u> </u>	1.4
21	a string of hala	nced parentheses	000	L4
	b. $I = \{a^n b^{2n} \mid n\}$	== 1 }		
	c. L = {ww ^R {w ε	[a,b] *].		
	d. L = {w [≖] ≖ ∈	$[a, b]^*$: # $_a(w) = # _b(w)$		
	Discuss the Teo	hniques for reducing non-determinism with example.	CO6	L2
е	Experiences		-	-
1			CO1	L2
2				
3				
4			CO3	L3
5				

Module – 4

Title:	Context free languages & Turing machine	Appr	10 Hrs
		Time:	
a	Course Outcomes	-	Blooms
-	The student should be able to:	-	Level
1	Prove some languages are not context free languages using pumping	CO7	L3
	lemma.		
2	Analyze ,design turing machine .	CO8	L4
b	Course Schedule	-	-
Class No	Module Content Covered	CO	Level
31	Context-Free and Non-Context-Free Languages: Where do the Context-	CO7	L2
	Free Languages(CFL) fit		
32	Showing a language is context-free, Pumping theorem for CFL	C07	L3
33	Important closure properties of CFLs, Deterministic CFLs.	C07	L3
34	Algorithms and Decision Procedures for CFLs: Decidable question	C07	L4
35	Un-decidable questions	CO7	L2
36	Turing Machine: Turing machine model, Representation, Language	CO8	L2

Logo	SKIT	Teaching Process	Rev No.: 1.0			
	Doc Code:	INST.Ph5b1.F02	Date: 3-C	8-2018		
Contract of	Title:	Course Plan	Page: 22	/ 29		
Copyright ©201	7. cAAS. All rights reserved					
	acceptabilityby	TM				
37	Turing Machin	e [.] Turing machine model Representation Language	CO8			
57	acceptabilityby TM					
38	Design of TM Te	echniques for TM construction	CO8	L4		
39	Design of TM Te	echniques for TM construction	CO8	L4		
40	Design of TM To	echniques for TM construction	CO8	L4		
с	Application Are	eas	со	Level		
1	Develop skills i model	n formal reasoning and reduction of a problem to a formal	CO7	L3		
2	Any computation performed by s	on that can be carried out by a mechanical means can be ome Turing machine	CO8	L4		
d	Review Questic		-	-		
1	 Prove that cont Union Concatenation Kleene star Reverse 	ext-free languages are closed under:	07	L3		
2	Prove that CFL's are closed under intersection and difference with the CO7 Regular languages					
3	State and prove	e pumping theorem for context free languages.	CO7	L2		
4	The Language (of Strings with n 2 a's i.e. L = $\{a : n \ge 0\}$ is not CFL	CO7	L4		
5	Prove that L = {a	a n b m a n : m, n ≥ 0, m≥n] is not context free.	CO7	L4		
6	Prove L = {wcw,	w is in {a,b}* } if not CFL	CO7	L4		
7	Using the pump proveWW = {wv	bing theorem in conjunction with the closure properties $w, w \in \{a, b\}^*\}$ is not context free	CO7	L4		
8	Using the pump simple arithmet viewed as posit	bing theorem in conjunction with the closure Properties, a tic language L = { $x#y = z : x, y, z \in \{0,1\}^*$ and if x, y, z are tive binary numbers without leading zeros, $xy = z R$ } is not	C07	L3		
9	Prove that ever strings in L end	y deterministic CFL is context free. (It is assumed that the s with \$)	CO7	L3		
10	Prove that ever	y deterministic CFL's are closed under complement	CO7	L3		
11	Prove that ever intersection .	y deterministic CFL's are not closed under union and	CO7	L3		
12	Write a note on	hierarchy of CFL.	CO7	L2		
13	Briefly explain r	epresentations of TM with example	CO8	L2		
14	Design a Turing number of 1's. C	g machine to recognize all strings consisting of an even Obtain the computation sequence for 11 and 111.	CO8	L4		
15	Design a Turing function over Σ to be w 1 w 2. G	machine over [1, b] which can compute a concatenation = [1]. If a pair of words (w 1 , w 2) is the input, the output has ive the computation for 11b111	CO8	L4		
16	Design TM that and 112233.	accepts {1 " 2 " 3 " n \ge 1 }. Write the ID's for 1223, 1123, 1233	CO8	L4		
17	Briefly explain t a. Turing Machin b. Storage in the c. Multiple Trac d. Subroutines	he following techniques of TM construction ne with Stationary Head e State k Turing Machine	CO8	L2		
18	Design a TM wh	nich can multiply two positive integers	CO8	L4		

Logo	SKIT	Teaching Process	Rev No.:	1.0	
	Doc Code:	INST.Ph5b1.F02	Date: 3-08-2018 Page: 23 / 29		
	Title:	Course Plan			
Copyright ©2017	. cAAS. All rights reserved			-	
е	Experiences		-	-	
1			CO1	L2	
2					
3					
4			CO3	L3	
5					

E2. CIA EXAM – 2

a. Model Question Paper - 2

Crs C	rs Code: 15CS54 Sem: V Marks: 30 Time:							75 minute	s	
Cour	se:	Automata	Theory & C	Computabi	lity					
-	-	Note: Ansv	wer any 2 d	questions,	each carry ea	qual marks	S.	Marks	СО	Level
1	а	Construct 1)let Σ=(a,b 2)L={ 0 ^m 1 ^m 2 3)L={ a ⁿ b ^m	context-fre)* obtain a !" n>=0,m>= c ^k n+2m=k	ee-languag grammar (1} for m,n>=	ge for the follo G generating s 0}	wing lang et of all pa	uages alindromes.	5	CO5	L4
	b	Show that for the san	ar 5	CO5	L4					
	С	Obtain PD/	A for the la	nguage L=	{a ⁿ b ⁿ n>=1}			5	CO6	L4
								5		
2	а	Is the PDA	determinis	stic L={wCv	v ^ℝ w ᢄ (a,b)*}			5	CO6	L4
	b	ls the PDA	determinis	stic L={# _a (w	/) = # _b (w) w E	(a,b)*}		5	CO6	L4
	С	Obtain the BOTTOM-	e PDA for JP parser	the follo E->E+T T	wing CFG us , T->T*F F	sing both F->(E) ic	TOP-DOWN ai	nd 5	CO6	L4
3	а	State and I	prove pum	ping lemn	na for CFL.			5	CO7	L3
	b	Show that	the langua	ige L={a ⁿ b ⁿ	c ⁿ n>=1}is not	CFL.		5	CO7	L3
	С	Prove that	every dete	erministic (CFL's are close	ed under c	complement		C07	L4
4	а	Briefly exp	lain repres	entations	of TM with exa	ample		5	CO8	L3
	b	Construct	5	CO8	L4					
	С	Design TM and 11223;	that acce ₃	ots {1 ⁿ 2 ⁿ (3 ⁿ n ≥ 1 }. Wri	e the ID's	for 1223, 1123, 12	33 5	CO8	L4

b. Assignment – 2

Note: A distinct assignment to be assigned to each student.

	Model Assignment Questions											
Crs C	ode:	15CS54	Sem:	V	Marks:	5	Time: g	90 – 120 minutes				
Cours	se:	Automat	a Theory & Co	omputability	У							
Note:	Each	student	to answer 2-3	assignmer	nts. Each as	signmer	nt carries equal ma	rk.				
SNo		USN		Assig	nment Des	scription	l	Marks	СО	Level		
1			Write the CF	G for follow	ing langua	ges.		5	CO5	L4		
			a. L= {a n b n	n>=0 }								
			b. L= {a 2n b r	n n>=0 }								
			c. L= {a n b 2r	n>=0 }								
			d. L= {a 2n b r	n n>=1 }								
			e. L= {a n b 2r	n>=1 }								
2			Simplify the f	ollowing gr	ammars:			5	CO5	L4		
			a)S 👝 aA bB									
			b)S 🗖 AB AC									
	_ aD bC											
3			Consider the		CO5	L4						
			Is the above	grammar ar	nbiguous?							

Le	go	SKIT	Teaching Process	Rev	No.: 1.0		
12		Doc Code	INST.Ph5b1.F02	Date	: 3-08-2	2018	
Con the second		Title:	Course Plan	Page: 24 / 29			
Copyrigh	t ©2017. cA	AS. All rights reserv	red.				
		Sho	w that the string "aab" has two -				
		i) Pa	arse trees				
		ii) L	eft most derivations				
		iii) F	Right most derivations				
4		Des	ign a PDA for the following language:	5	CO6	L4	
		L =	[wcw ^R : w ε [a,b]*].				
		Als	o Draw the transition diagram. Write the computation				
		(sea	quence of all				
		cor	figurations) for the input string 'abacaba' and 'abcab'				
5		Pro	ve that L = { a ⁿ b ⁿ c ⁿ , n≥0} not context free	5	CO7	L3	
6		Bri€	efly explain Turing Machine model. Give its definition.	5	CO8	L2	
7		Des	ign TM that accepts {0 ⁿ 1 ⁿ n≥ 1 }. Obtain the computation	5	CO8	L4	
		for	0011 and 010				
8		Pro	ve that L = { a n b n c n , n≥0} not context free	5	CO8	L4	
9		Pro	ve that context-free languages are not closed under:	5	CO8	L3	
		• int	ersection				
		• cc	mplement				
		• di	ference				
10		Cor	ivert the following CFG to CNF.	5	CO5	L4	
		S_	→aACa				
		A –	→_ B a				
		B	, →C c				
		C→	_Cc ε				

D3. TEACHING PLAN - 3

Module – 5

Title:	Multi tape turing machine & Linear bounded automata.	Appr Time:	10 Hrs
а	Course Outcomes	-	Blooms
-	The student should be able to:	-	Level
1	Understand multitape turing machine.	COg	L2
2	Understand Linear bounded automata	CO10	L3
b	Course Schedule	-	-
Class No	Module Content Covered	CO	Level
41	Variants of Turing Machines (TM), The model of Linear Bounded	CO9	L2
	automata: Decidability		
42	Definition of an algorithm, decidability, decidable languages	CO9	L2
43	Undecidable languages, halting problem of TM	CO9	L2
44	Post correspondence problem	CO10	L2
45	Complexity: Growth rate of functions	CO10	L3
46	The classes of P and NP	CO10	L2
47	Quantum Computation: quantum computers	CO10	L3
48	Quantum Computation: quantum computers	CO10	L2
49	Church-Turing thesis	CO10	L2
50	Church-Turing thesis	CO10	L2

Logo	SKIT	Teaching Process	Rev No.: 1.0
	Doc Code:	INST.Ph5b1.F02	Date: 3-08-2018
	Title:	Course Plan	Page: 25 / 29
Copyright ©2017. cA	AS. All rights reserved	•	·

С	Application Areas	СО	Level
1	Understand multitape turing machine.	CO9	L2
2	Understand Linear bounded automata	CO10	L3
d	Review Questions	-	-
1	Explain the following types of TM: a. Multitape TM	CO9	L2
	b. Non deterministic TM		
2	Prove that every language accepted by a multi-tape TM is acceptable by some single-tape TM (that is, the standard TM).	COg	L2
3	Prove that, if M 1 is the single-tape TM that simulates multitape TM M, then the time taken by M 1 to simulate n moves of M is O(n 2).	CO9	L3
4	Prove that, if M is a nondeterministic TM, there is a deterministic TM M 1 such that T(M) = T(M 1)	CO9	L3
5	Explain the model of Linear bounded Automata.	CO10	L2
6	Prove that a. A DFA is decidable. b. A CFG is decidable. c. A CSG is decidable.	CO10	L2
7	Prove HALT TM = {(M, w) The Turing machine M halts on input w} is undecidable.	CO10	L3
е	Experiences	-	-
1		CO1	L2
2			
3			
4		CO3	L3
5			

E3. CIA EXAM – 3

a. Model Question Paper - 3

Crs (Code:	15CS54	Sem:	V	Marks:	30	Time:	75 minute	es				
Cour	rse:	Automata 7											
-	-	Note: Answ	ver any 2 qu	estions, ead	ch carry equ	ıal marks.		Marks	СО	Level			
1	а	Define :						5	CO9	L2			
		a. recursive	recursively enumerable language										
		b. recursive	e language										
		c. decidabl	e languages										
		d. undecida	able languag	ges									
	b	Write short	notes on :					5	CO9	L2			
		a.Recursive	ely Enumeral	ble Languag	ge								
		b.Post corre	espondence	problem									
		c.Language	es of PDA										
	С	Define a tu	ring machine	e.show that	a multitape	turing mach	nine is euivale	ent 5	CO9	L2			
		to basic tur	ing machine	2									
			<u> </u>						0.0				
2	a	Write short	notes on Tu	iring machir	ie Halting p	roblem.		5_	009	L2			
	b	Write short	notes on M	ultitape IM.				5	CO9	L2			
	С	Write short	5	CO9	L2								
3	a	Prove that	5	CO10	L2								
		a. A DFA is	decidable.										

Logo	2	SKIT	Teaching Process	Rev No.: 1.0				
1200		Doc Code:	INST.Ph5b1.F02	Date: 3-08-2018				
Concertainte		Title:	Course Plan	Page	Page: 26 / 29			
Copyright ©2	017. cAAS	. All rights reserved.						
	b. A	CFG is deci	dable.					
	c. A	CSG is deci	dable.					
I=	Dura		4 [/A	-	0010			

	b	Prove HALT IM = {(M, w) The Turing machine M halts on input w} is undecidable.	5	CO10	L3
	С	Prove that ATM is undecidable.	5	CO10	L3
4	a	Show that the union of two recursively enumerable languages is recursively enumerable and the union of two recursive languages is recursive.	5	CO10	L3
	b	State and explain Church-Turing Thesis.	5	CO10	L2
	С	Write a note on guantum computation.	5	CO10	L2

b. Assignment – 3

Note: A distinct assignment to be assigned to each student.

	Model Assignment Questions											
Crs C	ode:	CS501PC	Sem:	I	Marks:	5 / 10	Time:	90 - 120	minutes	S		
Cours	se:	Design a	nd Analysis o	f Algorithm	S		·					
Note:	lote: Each student to answer 2-3 assignments. Each assignment carries equal mark.											
SNo		JSN		Assig	nment Desc	ription	-	Marks	СО	Level		
1			Write short no	otes on Turi	ng machine	Halting p	oroblem.	5	CO9	L2		
2			Write short no	otes on Mul	titape TM.			5	CO9	L2		
3	3 Show that the union of two recursively enumerable language is recursively enumerable and the union of two recursive languages is recursive.									L2		
4	4 a. Does the PCP with two lists x = (b, bab 3 , ba) and v = (b 3 ba, a) have a solution?								CO10	L4		
5			Prove that PC no solution.	P with two	lists x = (01,	1, 1), Y = ((01 2 , 10, 1 1) ha	is 5	CO10	L4		
6			If L is a recurs Σ* - L) is also ι	sive languaç recursive.	ge over Σ, sl	now that I	Ē (Ē is defined a	as	CO10	L4		
7			If L and L are are recursive.	both recurs	sively enum	erable, sł	now that L and	Ī 5	CO10	L3		
8	8 Prove that the growth rate of any exponential function i greater than that of any polynomial.											
9	9 Prove that A TM is undecidable.									L4		
10	10 Write a note on quantum computation.									L2		

F. EXAM PREPARATION

1. University Model Question Paper

Cou	rse:	Automata Theory & Computability Month /										′ Year	May /:	2018	
Crs (Code:	15CS	54		Sem	:	V		Marks:	80	-	Time:		180 minutes	
-	Note	Answ	ver al	l FIV	'E full	quest	ions. All qu	Jestic	ons carry eq	ual mark	S.		Marks	СО	Level
1	а	Defin ii) N F	efine i) Powers of an alphabet N F A.											CO1	L2
	b	Desię i) L = ii) L = iii) Th	Design a DFA to accept the following language over the alphabet { 0, 1 }.) L = {co co is a even number} i) L = {(01)' 1 23 i 1, j 1} ii) The set of strings either start with 01 or end with 01										6	CO2	L4
	С	Cons	$\begin{array}{c c} \hline c \\ \hline c \\ \hline c \\ \hline \end{array} \\ \hline \end{array} \\ \hline \begin{array}{c} c \\ \hline c \\ \hline \end{array} \\ \hline \end{array} \\ \hline \begin{array}{c} c \\ \hline \end{array} \\ \hline \end{array} \\ \hline \begin{array}{c} c \\ \hline \end{array} \\ \hline \end{array} \\ \hline \begin{array}{c} c \\ \hline \end{array} \\ \hline \end{array} \\ \hline \begin{array}{c} c \\ \hline \end{array} \\ \hline \end{array} \\ \hline \end{array} \\ \hline \begin{array}{c} c \\ \hline \end{array} \\ \hline \end{array} \\ \hline \end{array} \\ \hline \begin{array}{c} c \\ \hline \end{array} \\ \hline \end{array} \\ \hline \end{array} \\ \hline \begin{array}{c} c \\ \hline \end{array} \\ \hline \end{array} \\ \hline \end{array} \\ \hline \begin{array}{c} c \\ \hline \end{array} \\ \hline \end{array} \\ \hline \end{array} \\ \hline \end{array} \\ \hline \begin{array}{c} c \\ \hline \end{array} \\ \\ \hline \end{array} \\ \\ \hline \end{array} \\ \\ \hline \end{array} \\ \hline \end{array} \\ \\ \\ \hline \end{array} \\ \\ \hline \end{array} \\ \\ \hline \end{array} \\ \\ \\ \hline \end{array} \\ \\ \\ \\$										8	CO2	L4
		р	p null p q r												

Logo		S	KIT		Teaching Process			Rev No.: 1.0			
		Doc	Code:	INST	INST.Ph5b1.F02				Date: 3-08-2018		
		Title:		Cour	se Pla	an	Page: 27 / 29				
Copyrig	ht ©2017. c	AAS. All rig	hts reserve	ed.							
		q p	q	r	null						
		r q	r	null	р						
						OR					
-	а	Mentic	n the c	lifferer	ices t	petween DEA, NEA and E-NEA.	2	CO1	12		
	b	Desiar	a DFA	which		epts set of all strings of 0's and I's, beginning with	6	CO2	L4		
		a 1 that, when interpreted as a binary integer, is a multiple of 5. For example, strings 101, 1010 and 1111 are in the language; 0, 100, 0101 and 111 are not									
	С	convert the following NFA to DFA using subset construction method 0 1						CO2	L4		
		р	{p,q}	{p}							
		a	null	{r}							
		Ч	1 1011		_						
		r	{p,r}	{q}			ļ				
-								0.00			
2	a	Give th i)L = {a ^r	ie regu ⁱ b ^m : n <	lar exp <= 4, m	oressi >= 2} ;	ii) L = {w : W (0, 1)* and w mod 3 = 0}.	4	C03	L4		
	b	Define CFG. Design a context free grammar for the languages: (i)_L = {a ⁱ b ^j c ^k , where i = j + k, i, j, k >=0}. ii) L = {0 ⁿ⁺² 1 ⁿ : n >=1}						CO4	L4		
	С	What i ambigi S —> A A —> A B —>b.	s an an uous oi .B/aaB .a/a	8	CO4	L4					
						OR					
-	а	Write F	R.E for t	the fol	owin	g language	4	CO3	L4		
		1)L={a²r	b ^{2m} n>=	=0,m>=	0} 2)L	={w: w mod3=0 where w ɛ (a,b)*}					
	b	how a regular language for each of the following languages 1)L={w E {a,b}*:w contains the substring abb} 2)L={w E {a b}*:w does not end in aa}						CO4	L4		
	С	Show t 1)L={an	hat fol bn n>=	4	CO4	L4					
3	a	Constr 1)let Σ= 2)L={ 0'	uct cor (a,b)* o "1 ^m 2" n	ntext-f btain a >=0,m>	ree-la a gran •=1}	anguage for the following languages nmar G generating set of all palindromes.	4	CO5	L4		
	b	Show for the	that th same:	e grar S ->(S)	nmar ,	is ambiguous & obtain unambiguous grammar S->SS , S-> E	8	CO5	L4		
	С	Obtain	PDA fo	or the l	angu	age L={a ⁿ b ⁿ n>=1}	4	CO6	L4		
						OR					
-	а	Remo a) S ے	/e amb → (S) :	iguity SS e	from	following grammars. b) E $_{\circ}$ $_{\circ}$ \rightarrow E+E E*E (E) id	6	CO5	L4		
	b	Is the F	PDA de	termin	istic L	_={wCw ^R w ɛ (a,b)*}	4	CO6	L4		
	С	Is the F	PDA de	termir	istic L	$= [\#_{a}(w) = \#_{b}(w) w \epsilon (a,b)^{*}]$	6	CO6	L4		
4	a	State a	ind pro	ve pur	nping	theorem for context free languages.	4	C07	L2		
	b	The La	nguag	e of St	rings	with n 2 a's i.e. L = {a : n ≥ 0} is not CFL	6	C07	L4		
	С	Briefly	explair	n repre	senta	ations of TM with example	6	CO8	L3		
		_				OR	ļ				
-	a b	Prove	that ev	ery de	termi	nistic CFL's are closed under complement	4	CO7	L3		
		interse	ction .	ery de	Lenni		4	00/	∟്		

Logo		SKIT	Teaching Process	Rev N	0.: 1.0				
(Doc Code:	INST.Ph5b1.F02	Date: :	3-08-20	018			
		Title:	Course Plan	Page:	28 / 29)			
Copyrig	opyright ©2017. cAAS. All rights reserved.								
	С	Design TM that accepts {1 ⁿ 2 ⁿ 3 ⁿ n ≥ 1 }. Write the ID's for 1223, 1123, 1233 and 112233				L4			
5	а	Explain the fol a. Multitape TN b. Non determ	6	CO9	L2				
	b	Prove that eve some single-ta	6	CO9	L2				
	С	Prove HALT 1 undecidable.	4	CO10	L3				
		OR							
-	a	Prove that, if N such that T(M)	M is a nondeterministic TM, there is a deterministic TM M 1 = T(M 1)	6	CO9	L3			
	b	Prove that A T	M is undecidable.	6	CO10	L4			
	С	Write a note o	n quantum computation.	4	CO10	L2			

2. SEE Important Questions

Course:		Automata Theory & Computability Mont	h / Year	May /	2018
Crs Code:		15CS54 Sem: 5 Marks: 80 Time	:	180 m	inutes
	Note	Answer all FIVE full questions. All questions carry equal marks.	-	-	
Mo dul e	Qno.	Important Question	Marks	CO	Year
1	1	Give Formal definition of DFA. And also Design a DFA to read a strir made up of letters"computer" and recognize the strings that contains the word "cut" as a subs tring.	ng 10 ne	CO2	2017
	2	Design a DFA to accept strings of a's and b's not ending with abb	5	CO2	2017
	3	Design the DFA's for the following languages: i)Set of all strings with at least one 'a' and exactly two `b's on E = {a, b}. ii) Set of all strings such that number of 1's is even and the number of 0 is a multiple of 3 on E = {0, 1}.	8 o's	CO2	2016
	4	Design an NFA with no more than 5 states for the following language: L = {abab ⁿ n>=0 }U{aba ⁿ n>=0 }	6	CO2	2016
	5				2007
2	1	Define regular expression and also write the regular expressions for th following language L = {w€ {a, b}* w has exactly one pair of consecutive a's}.	ne 4	CO3	2015
	2	Convert the regular expression $(0 + 1)^*$ (0 + 1) to an NFA.	6	CO3	2016
	3	Minimize following DFSMs	10	CO3	2015
		a a a a a a a a a a			
	4	Mention the applications of regular expressions.	2	CO4	2014
	5	State and prove pumping lemma for regular languages.	10	CO4	2014
	_				
3	1	Define CFG. Design a context free grammar for the languages: i)L = {a ⁱ b ⁱ c ^k , where i = j + k, i, j, k>= 0}. ii) L = {01 ⁿ⁺² 1 ⁿ : n >= 1}	8	c05	2014
	2	What is an ambiguous grammar? Show that the grammar shown below	is 6		2014

A	ogo	SKIT Teaching Process		Rev No.: 1.0				
		Doc Code:	c Code: INST.Ph5b1.F02			Date: 3-08-2018		
Co.		Title:	Title: Course Plan					
Copyright ©2017. cAAS. All rights reserved.								
		ambiguous on						
		string "aab".						
		$S \rightarrow AB/aaB$						
		A —> Aa/a						
	2	D = 20	4	C06	2010			
	3	Cenetrust a DDA that accents the larguage local by PDA.				2010		
	4	graphical rep description of	10	000	2010			
	5	What are Useless Productions? Remove all useless productions, unit productions and all s - productions from the grammar:				2009		
4	1	prove that if L	is a CFL and R is a regular language then L n R is a CFL.	6	CO7	2011		
	2	Define Turing machine.	Machine and Instantaneous Descriptions (ID) for Turing	4	C08	2011		
	3	Show that a ⁿ b ⁿ c ⁿ is not a context free language using pumping lemma of CFL				2013		
	4	Design a Turing machine to accept a ⁿ b ⁿ c ⁿ				2012		
	5	Design a Turing machine to accept the set of all palindromes over (0, }*. moves made by Turing machine for the string : 1001.				2011		
5	1	Write a note o machine.	on multitape Wring machine and non-deterministic turing	6	CO9	2013		
	2	Write short no a.Post corresp b.Halting prob c.Universal tur	tes on: ondence problem lem in TM ing machine	15	CO9	2013		
	3	Write short no a.Post's corres b.Recursive laı	tes on the following topics: pondence problem. nguage and it's relationship with and non-RE languages	10	CO10	2015		
	4	Write a short r	note on Undecidability of ambiguity for CFG's.	4	CO10	2015		
	5	Explain the languages.	relationship between the recursive, RE and non-RE	6	CO10	2005		