Lingaya's Vidyapeeth

Deemed-to-be-University u/s 3 of UGC Act 1956, Government of India
NAAC ACCREDITED
Approved by MHRD / AICTE / PCI / BCI / COA / NCTE
Nachauli, Jasana Road, Faridabad- 121002 (Haryana)
Website: www.lingayasvidyapeeth.edu.in | Ph: 0129-2598200-05

COURSE PLAN & COURSE DATA SHEET

PROGRAM: B.Tech	DEGREE:
COURSE: Formal Language & Automata Theory	SEMESTER: IV CREDITS: 4
COURSE CODE: CS-303 REGULATION:	COURSE TYPE: CORE
COURSE AREA/DOMAIN:	CONTACT HOURS: 3+1 (Tutorial) hours/Week.
CORRESPONDING LAB COURSE CODE (IF ANY): NO	LAB COURSE NAME (IF ANY): NA

PROGRAM EDUCATIONAL OBJECTIVES:

SYLLABUS:

UNIT	DETAILS	HOURS
I	**FINITE AUTOMATA AND REGULAR EXPRESSIONS**: Finite state systems; basic definitions non-deterministic finite automata (NDFA), deterministic finite automata (DFA), equivalence of DFA and NDFA, finite automata with e-moves, limitations of FSM, Moore and Mealy Machines, equivalence of Moore and Mealy Machines, Minimization of Finite Automata.	8
II	**PROPERTIES OF REGULAR SETS**: Regular expressions, equivalence of finite automata and regular expressions, regular expression conversion and vice versa, Arden's theorem. The Pumping Lemma for regular sets, applications of the pumping lemma, closure properties of regular sets.	7
III	**CONTEXT FREES GRAMMARS & GREIBACH NORMAL FORM:** Definition, context free and context sensitive grammar; ambiguity regular grammar; reduced forms; Chomsky Normal Form (CNF), Greibach Normal Form (GNF).	9
IV	**PUSHDOWN AUTOMATA:** Introduction to pushdown machines; design of PDA; conversion of PDA to CFG and vice versa, application of pushdown machines.	6
V	**TURING MACHINES:** Basic concepts of Turing machines, deterministic and non- deterministic Turing machines; design of Turing machines; halting problem of Turing machines.	5
	TOTAL HOURS	35

Teacher Centric Approach **TC1: Chalk and Talk, TC2: PPT, TC3: Video Lectures TC4: Blended learning**
Learner Centric Approach: **LC1: Assignment. LC2: Mini project. LC3: Quiz/Class test. LC 4: Seminar on recent trends.** **LC5: Group Task. LC6: Others**

DETAILED SESSION PLAN

Lecture session/ Number	Topics to be covered	CO addressed	Teacher Centric Approach	Learner Centric Approach	References	Relevance with POs and PSOs
1	**UNIT-1 Finite Automata and Regular Expressions:** Basic definitions of automata and finite automata	CO1	TC1, TC2	LC1	T1	
2	Deterministic finite automata (DFA)	CO1	TC1, TC2	LC1	T1	
3	Non-deterministic finite automata (NDFA)	CO1	TC1, TC2	LC1	T1	
4	Equivalence of DFA and NDFA	CO1	TC1, TC2	LC1	T1	
5	Equivalence of DFA and NDFA	CO1	TC1, TC2	LC1	T1	
6	Moore and Mealy Machines	CO1	TC1, TC2	LC1	T1	
7	Equivalence of Moore and Mealy Machines.	CO1	TC1, TC2	LC1	T1	
8	Minimization of Finite Automata	CO1	TC1, TC2	LC1	T1	

9	**UNIT-2 Properties of Regular Sets:** Regular expression and properties	CO2	TC1, TC2	LC1	T1
10	equivalence of finite automata and regular expressions.	CO2	TC1, TC2	LC1	T1
11	Regular expression conversion and vice versa	CO2	TC1, TC2	LC1	T1
12	Arden's theorem	CO2	TC1, TC2	LC1	T1
13	Pumping Lemma	CO2	TC1, TC2	LC1	T1
14	Closure properties of regular sets.	CO2	TC1, TC2	LC1	T1
15	Doubt class	-	TC1, TC2	LC1	T1
16	**UNIT-3 Context Free Grammar & Greibach Normal Form:** Definition, Context free grammar	CO3	TC1, TC2	LC1	T1
17	Ambiguity in grammar;	CO3	TC1, TC2	LC1	T1
18	Reduced CFG	CO3	TC1, TC2	LC1	T1
19	Reduced CFG Cont.	CO3	TC1, TC2	LC1	T1
20	Chomsky Normal Form (CNF)	CO3	TC1, TC2	LC1	T1
21	Chomsky Normal Form (CNF) Cont.	CO3	TC1, TC2	LC1	T1
22	Greibach Normal Form (GNF).	CO3	TC1, TC2	LC1	T1
23	Greibach Normal Form (GNF) Cont.	CO3	TC1, TC2	LC1	T1
24	Doubt class	-	TC1, TC2	LC1	T1

25	**UNIT-4 Pushdown Automata:** Introduction to pushdown machines	CO4	TC1, TC2	LC1	T1
26	Design of PDA	CO4	TC1, TC2	LC1	T1
27	Conversion of PDA to CFG	CO4	TC1, TC2	LC1	T1
28	Conversion of CFG to PDA	CO4	TC1, TC2	LC1	T1
29	Application of pushdown machines.	CO4	TC1, TC2	LC1	T1
30	Doubt class	-	TC1, TC2	LC1	T1
31	**UNIT-5 Turing Machines:** Basic concepts of Turing machines	CO5	TC1, TC2	LC1	T1
32	Deterministic and non-deterministic Turing machines	CO5	TC1, TC2	LC1	T1
33	Design of Turing machines	CO5	TC1, TC2	LC1	T1
34	Halting problem of Turing machines.	CO5	TC1, TC2	LC1	T1
35	Doubt class /Revision class	-	TC1, TC2	LC1	T1

TEXT/REFERENCE BOOKS:

T/R	BOOK TITLE/AUTHORS/PUBLICATION
T1	Mishra K. L. P. and Chandrasekaran N., "Theory of Computer Science - Automata, Languages and Computations", Prentice Hall of India, 2000.
T2	Hopcroft, Ullman O. D. and Mothwani R., "Introduction to Automata Theory, Language & Computations", Addison Wesley, 2001.
R1	Linz Peter, "Introduction to Formal Languages & Automata", Narosa Publications, 2001
R2	Greenlaw Ramond and Hoover H. James, "Fundamentals of the Theory of Computation - Principles and Practice", Harcourt India Pvt. Ltd., 1998

COURSE PRE-REQUISITES:

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C.CODE	COURSE NAME	DESCRIPTION	SEM

COURSE OBJECTIVES:

1	Understand basic properties of formal languages and formal grammars
2	Understand basic properties of deterministic and nondeterministic finite automata
3	Understand the relation between types of languages and types of finite automata.
4	Understanding the Context free languages and grammars, and also Normalizing CFG.
5	Understanding the minimization of deterministic and nondeterministic finite automata.
6	Understand basic properties of Turing machines and computing with Turing machines
7	Understand the concept of Pushdown automata and its application.

COURSE OUTCOMES:

S.NO	DESCRIPTION	PO(1..12) MAPPING	PSO(1..3) MAPPING
Cxxx.1	Understand the relation between types of languages and types of finite automata.	PO1,PO2,PO3,PO5,PO6	PSO1
Cxxx.2	An ability to design grammars and automata for different language classes.	PO1,PO2,PO3,PO5,PO6	POS1,PSO2
Cxxx.3	Understanding the Context free languages and grammars and also normalizing CFG.	PO1,PO2,PO5,PO6,PO8,PO12	PSO1,PSO2,PSO3
Cxxx.4	Understand the concept of pushdown automata and its application.	PO1,PO2,PO4,PO5,PO6,PO9,PO12	PSO1,PSO3
Cxxx.5	To understand basic properties of Turing machines and computing with Turing	PO1,PO2,PO4,PO5,PO6,PO8,PO9,PO12	PSO1,PSO3
COURSE OVERALL PO/PSO MAPPING:			

COURSE OUTCOMES VS POs MAPPING (DETAILED; HIGH: 3; MEDIUM:2; LOW:1**):**

S.NO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	1	1		1	1							3		
CO.2	2	1	1		3	1							1	2	
CO.3	1	1			1	1		1				1	1	1	1
CO.4	1	1		1	1	1			1			1	1		1
CO.5	1	1		1	1	1		1	1			1	1		1

** For Entire Course, PO & PSO Mapping*

POs & PSO REFERENCE:

PO1	Engineering Knowledge	PO7	Environment & Sustainability	PSO1	To equip the students with theoretical and implementation knowledgebase in all the latest areas of Computer Science & Engineering for a successful career in software industries, pursuing higher studies, or entrepreneurial establishments.
PO2	Problem Analysis	PO8	Ethics	PSO2	To nurture the students with the critical thinking abilities for better decision making by offering them a socially acceptable solutions to real life problems through computing paradigm.

PO3	Design & Development	PO9	Individual & Team Work	PSO3	To nurture the students with the comprehensive analytical and design abilities by offering them techno-commercially feasible solutions of real business problems through computing.
PO4	Investigations	PO10	Communication Skills		
PO5	Modern Tools	PO11	Project Mgt. & Finance		
PO6	Engineer & Society	PO12	Life Long Learning		

COs VS POs MAPPING JUSTIFICATION:

S.NO	PO/PSO MAPPED	LEVEL OF MAPPING	JUSTIFICATION
Cxxx.1			
Cxxx.2			
Cxxx.3			
Cxxx.4			
Cxxx.5			
Cxxx*			

GAPS IN THE SYLLABUS - TO MEET INDUSTRY/PROFESSION REQUIREMENTS, POs & PSOs:

SNO	DESCRIPTION	PROPOSED ACTIONS
1		
2		
3		
4		
5		

PROPOSED ACTIONS: TOPICS BEYOND SYLLABUS/ASSIGNMENT/INDUSTRY VISIT/GUEST LECTURER/NPTEL ETC

 # TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN:

1	
2	
3	
4	
5	
6	
7	

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☐ CHALK & TALK	☐ STUD. ASSIGNMENT	☐ WEB RESOURCES	☐ NPTEL/OTHERS
☐ LCD/SMART BOARDS	☐ STUD. SEMINARS	☐ ADD-ON COURSES	☐ WEBNIARS

ASSESSMENT METHODOLOGIES-DIRECT

☐ ASSIGNMENTS	☐ STUD. SEMINARS	☐ TESTS/MODEL EXAMS	☐ UNIV. EXAMINATION
☐ STUD. LAB PRACTICES	☐ STUD. VIVA	☐ MINI/MAJOR PROJECTS	☐ CERTIFICATIONS

☐ ADD-ON COURSES	☐ OTHERS		

ASSESSMENT METHODOLOGIES-INDIRECT

☐ ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)	☐ STUDENT FEEDBACK ON FACULTY (TWICE)
☐ ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS	☐ OTHERS

 # INNOVATIONS IN TEACHING/LEARNING/EVALUATION PROCESSES:

1. **Technology Integration:** Embrace and integrate technology tools in the classroom to enhance the learning experience. This can include interactive whiteboards, educational apps, virtual reality, and online collaboration platforms. Utilizing technology allows for more dynamic and interactive lessons, catering to diverse learning styles.
2. **Personalized Learning Paths:** Implement personalized learning approaches that cater to individual student needs and pace of learning. Adaptive learning platforms and data analytics can help tailor educational content, assignments, and assessments based on the strengths and weaknesses of each student, promoting a more customized learning experience.
3. **Active Learning Strategies:** Move away from traditional lecture-based approaches and incorporate active learning strategies. This involves engaging students in hands-on activities, group discussions, problem-solving exercises, and real-world projects. Active learning fosters critical thinking, collaboration, and practical application of knowledge.
4. **Blended Learning Models:** Adopt blended learning models that combine face-to-face instruction with online resources. This allows for flexibility in learning, enabling students to access materials at their own pace outside the classroom. Flipped classrooms, where students learn new concepts online and engage in discussions and activities during class, are an example of a blended learning approach.
5. **Assessment Innovation:** Rethink assessment methods to go beyond traditional exams and quizzes. Explore alternative forms of assessment, such as project-based assessments, portfolios, presentations, and peer assessments. Additionally, incorporate formative assessments and feedback throughout the learning process to help students track their progress and make improvements.

Prepared by
(Ms. Komal Malsa)

Approved by
(HOD)

 # Additionally, the details to be compiled separately by the Departmental Coordinator for the entire Department.