SRI RAAJA RAAJAN
COLLEGE OF ENGINEERING AND TECHNOLOGY
(Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai)
146/14B1, Amaravathi Village, Amaravathiputhur Post,
Karaikudi – 630 301, Sivagangai Dt, Tamil Nadu
Website : www.sriraajaraajan.in, E-mail : srrcet2010@gmail.com, Ph: 04565-234230

Course Plan ODD Semester 2021-2022

Program	B.E. Computer Science and Engineering
Semester	V semester
Course Code	CS850
Subject Code & Title	CS8501 THEORY OF COMPUTATION
Number of credits	3
Course Coordinator	Mrs.V.Manju, AP/CSE
Program Coordinator	Mr.S.Aanjan Kumar, AP/CSE

Course Description

In the subject Theory of Computation which mainly deals with the logic of computation with respect to simple machines, referred to as automata.

Automata* enables scientists to understand how machines compute the functions and solve problems. The main motivation behind developing Automata Theory was to develop methods to describe and analyze the dynamic behavior of discrete systems.

Automata originated from the word "Automaton" which is closely related to "Automation".

Course Objective
- To understand the language hierarchy
- To construct automata for any given pattern and find its equivalent regular expressions
- To design a context free grammar for any given language
- To understand Turing machines and their capability
- To understand undecidable problems and NP class problems

Program Outcomes
On completion of the program the graduates will be able to

Program Outcomes		Description
PO1	Engineering Knowledge	Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
PO2	Problem Analysis	Identify, formulate, review research literature and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
PO3	Design/ Development of Solutions	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety and the cultural, societal and environmental considerations.
PO4	Conduct Investigation of Complex Problems	Use research-based knowledge and research methods including design of experiments, analysis and interpretations of data, and synthesis of the information to provide valid conclusions.

PO5	Modern Tool Usage	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6	The Engineering and Society	Apply reasoning informed by the contextual knowledge to access societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	Environment and Sustainability	Understand the impact of the professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of, and need for sustainable development.
PO8	Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and Team Work	Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.
P10	Communication	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
P11	Project Management and Finance:	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
P12	Life-long learning	Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Programme Specific Outcomes

At the end of the Programme graduate will be able to

PSO	Description
PSO.1	Graduates will take up careers in Computation and Programming
PSO.2	Graduates will Design and develop products, utilize their knowledge and skills as engineer / start their own ventures as entrepreneurs
PSO.3	Graduates will take up educational program in mastering Computer Science and Engineering Science and Management.

Programme Educational Objectives

Graduates of Mechanical Engineering Programme will:

PEO	Description
PEO.1	Practice Mechanical Engineering in the general streams of thermal, design, manufacture, service and allied engineering sectors
PEO.2	Habituate continuous learning and carryout research and development in science, engineering and technology that support career growth
PEO.3	Exhibit ethical code of conduct in professional way to resolve real time engineering projects
PEO.4	Demonstrate managerial and leadership capabilities that supports economic development of self and society

Course outcomes

At the end of the Course, Students will be able to:

	Course Outcome	POs	PIs	BL
CS850.1	Construct automata, regular expression for any pattern.	PO1, PO2, PO3, PSO1	1.3.1, 1.4.1, 2.1.1, 2.1.2, 2.1.3, 3.1.3, 9.2.1, 10.1.1, 10.1.3, 10.3.1	Apply
CS850.2	Write Context free grammar for any construct.	PO1, PO2, PO3, PSO1	1.3.1, 1.4.1, 2.1.1, 2.1.2, 2.1.3, 3.1.3, 9.2.1, 10.1.1, 10.1.3, 10.3.1	Apply
CS850.3	Design Turing machines for any language.	PO1, PO2, PO3, PSO1	1.3.1, 1.4.1, 2.1.1, 2.1.2, 2.1.3, 3.1.3, 9.2.1, 10.1.1, 10.1.3, 10.3.1	Apply
CS850.4	Propose computation solutions using Turing machines.	PO1, PO2, PO3, PSO1	1.3.1, 1.4.1, 2.1.1, 2.1.2, 2.1.3, 3.1.3, 9.2.1, 10.1.1, 10.1.3, 10.3.1	Apply
CS850.5	Derive whether a problem is decidable or not.	PO1, PO2, PO3, PSO1	1.3.1, 1.4.1, 2.1.1, 2.1.2, 2.1.3, 3.1.3, 9.2.1, 10.1.1, 10.1.3, 10.3.1	Apply

Mapping of PO & PSO and CO

CO	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C850.1	3	2	1						1	1			3	2	1
C850.2	3	2	1						1	1			3	2	1
C850.3	3	2	1						1	1			3	2	1
C850.4	3	2	1						1	1			3	2	1
C850.5	3	2	1						1	1			3	2	1

Delivery and instruction methods

o Chalk and board
o PPTs
o Tutorials

o Collaborative Learning
   Activity/Problems Based Learning

Assessment Methods

o Internal Assessment Tests
o Quiz
o Presentations

o Assignments
o Anna University Examinations

Text and Reference Books

Sl. No.	Title	Author	Publisher
T1	Introduction to Automata Theory, Languages and Computations",	J.E. HopCroft, R.Motwani and J.D.Ullaman	Perason Education, 2003
R1	Elements of Theory of Computation	H.R. Lewis and C.H.Padadimitriou	PHI, 2003
R2	"Introduction of Languages and the Theory of Computation"	J.Martin	Tata Mcgraw Hill, 2003
R3	Introduction to Theory of Computation	Michael Sipser	Thomson Brokecole, 1997

Lesson Plan

S. No.	Topics to Covered	No. of periods	Cumulative no. of periods	Pg no.(s) of T/R Book
Unit I: AUTOMATA FUNDAMENTALS				
1	Introduction to formal proof –	2	2	R1 1.2 – 1.10
2	Additional forms of Proof –	2	4	R1 2.2 – 2.11
3	Inductive Proofs	1	5	R1 3.2 – 3.8
4	Finite Automata	2	7	R1 3.3 – 3.7
5	Deterministic Finite Automata	2	9	R 1 3.8 – 3.12
6	Non-deterministic Finite Automata	2	11	R 1 3.12 – 3.16
7	Finite Automata with Epsilon Transitions	2	13	R 1 3.16 – 3.24
Unit II REGULAR EXPRESSION AND LANGUAGES				
8	Regular Expressions	1	24	R1 7.2 – 7.12
9	Boundary layer concept – velocity and thermal boundary layers Non-dimensional numbers	1	25	R1 7.12 – 7.19
10	FA and Regular Expressions	1	26	R1 8.2 – 8.22
11	Proving Languages not to be regular	2	28	
12	Closure Properties of Regular Languages	1	29	R1 9.2 – 9.20
13	Equivalence and Minimization of Automata.	4	33	
Unit III CONTEX FREE GRAMMAR AND LANGUAGES				
14	Context Free Grammar	1	39	R1 11.2 – 11.10
15	Parse Trees	2	41	
16	Ambiguity in Grammars and Languages	1	42	R1 11.10 – 11.17
17	Definition of Push Down Automata	2	44	
18	Heat exchanger types – overall heat transfer coefficient – fouling factor – LMTD method	2	46	R1 13.2 – 13.12
19	Problems from Anna University Question papers	3	49	
Unit IV PROPERTIES OF CONTEXT FREE LANGUAGES				
20	Normal forms for CFG	2	55	R1 12.2 – 12.9
21	Pumping Lemma for CFL	1	56	R1 12.9 – 12.15
22	Closure Properties of CFL	1	57	R1 12.15 – 12.22
23	Turing Machines	2	59	
24	Programming Techniques for TM	3	62	R1 12.22 – 12.24
Unit V Undecidability				
25	Non Recursive Enumerable (RE) Language	2	70	R1 14.2 – 14.5
26	Undecidable Problem with RE	1	71	R1 14.5 – 14.9
27	Undecidable Problems about TM	1	72	R1 14.9 – 14.11

28	Post Correspondence Problem	1	73	R1 14.11 – 12.12
29	The Class P and NP	10	83	

Assessment Plan for the course

S. No	Course Outcome	How measured	When measured
1	C850.1	Based on the IA Test I & III, Assignment I, Anna University Exam	After IA Test I&III, Anna University Exam
2	C850.2	Based on the IA Test I & III, Assignment II, Anna University Exam	After IA Test I&III, Anna University Exam
3	C850.3	Based on the IA Test II & III, Assignment III, Anna University Exam	After IA Test II&III, Anna University Exam
4	C850.4	Based on the IA Test II & III, Assignment IV, Anna University Exam	After IA Test II&III, Anna University Exam
5	C850.5	Based on the IA Test III, Assignment V, Anna University Exam	After IA Test III, Anna University Exam

Assignment and Quiz

Unit	Test	Date	Assignment	Quiz
I	Internal Assessment Test I	22.04.2022	08.04.2022	17.05.2022
			29.04.2022	17.05.2022
II,III	Internal Assessment Test II	25.05.2022	09.05.2022	17.05.2022

Course Attainment Criteria

Measuring Course Outcomes attained through University Examinations

Attainment Level	Description	Correlation Level
1	80% students scoring a pass marks in the University Examination	Slight (1)
2	85% students scoring a pass marks in the University Examination	Moderate (2)
3	90% students scoring a pass marks in the University Examination	Substantial (3)

Measuring Course Outcomes attained through Internal Assessment

Attainment Level	Description	Correlation Level
1	72% students scoring more than 50% of maximum marks in the relevant COs	Slight (1)
2	75% students scoring more than 50% of maximum marks in the relevant COs	Moderate (2)
3	84% students scoring more than 50% of maximum marks in the relevant COs	Substantial (3)

HoD

PRINCIPAL
Sri Raaja Raajan College of Engg. & Tec
Amaravathipudur, Karaikudi - 630 30
Sivagangai Dist. Tamil Nadu