Guru Nanak Dev Engineering College, Bidar

Course File planning

Automata theory and Computability (18CS54)

Credit: 04 Teaching Hours/Week (L: T: P) = (3:0:0)

CONTENTS

Course Objectives:

This course will enable students to

1. Explain and Design the Core Concepts of Automata theory and Computations.
2. Demonstrate and Analyze the Regular Expression, Grammar and closure Properties of Regular Language
3 .Construction of Grammar, Parse Tree and Design of Push Down Automata
4 Analyze the Decidable, Undecidable Properties and Construction of Turing Machine
5. Determine the decidability and intractability of Computational problems

Pre-requisites:

1. set theory
2. Functions and relations

Linkages with other Courses:

1. compiler Design
2. lex and yacc

Course Policies and Procedures:

(Expectations from students, Rules for Student Assignments, Assignment Grading System, CIE and Semester End Examinations.)

Expectations from student:

1. Students should have the knowledge of pre-requisite
2. Students should complete all assignments in a time bound manner

Rules for assignments:

1. Group Activity: One group activity on applications of modern tools in design of Deterministic and Non_Determinstic Finite Automata

Assignment Grading System:

Each assignment will be evaluated for 10 marks and final score for assignment will be the average marks scored in all the assignments.

CIE and Semester End Examinations: As per the VTU regulations.

Evaluation Policy(It is only indicative, may vary from course to course):

Level of Question	Approximate % of Question
Understanding	20
Apply	40
Analyze / Solve	20
Design	20

Module wise distribution of Classes	**Topics**	**Class Number**	**Teaching Methodology**
	Overview of course, Course Outcome its linkages with other courses and practical applications, expectations from students, Evaluation Policy etc.	1	Interactive Discussion
08	**Module 1:**Strings, Languages**.**	2	Lecture/PPT
	A Language Hierarchy, Computation	3	Lecture/PPT
	finite State Machines	4	Lecture/PPT
	Deterministic FSM, Regular languages, Designing FSM	5	Lecture/PPT
	Nondeterministic FSMs, From FSMs to Operational Systems	6	Lecture/PPT
	Nondeterministic FSMs, From FSMs to Operational Systems	7	Lecture/PPT
	Minimizing FSMs, Canonical form of Regular languages	8	Lecture/PPT
		9	Revision / Quiz
08	**Module 2**:Introduction to regular Expression	10	Lecture/PPT
	Manipulating and Simplifying Res	11	Lecture/PPT
	Regular Grammars: Definition,	12	Lecture/PPT
	Regular Grammars and Regular languages	13	Lecture/PPT
	Regular Languages (RL) and Non regular Languages	14	Lecture/PPT
	How many RLs, To show that a language is regular	15	Lecture/PPT
	Kleen's theoram	16	Lecture/PPT
	Closure properties of RLs, show some languages are not RLs.	17	Lecture/PPT
		18	Revision / Quiz
	Module 3: Context Free Grammar	19	Lecture/PPT
	Introduction to Rewrite Systems and Grammars,	20	Lecture/PPT
	CFGs and languages, designing CFGs	21	Lecture/PPT
	Normal Forms.	22	Lecture/PPT

	Derivation and Parse trees, Ambiguity	23	Lecture/PPT
	Definition of non-deterministic PDA, Deterministic	24	Lecture/PPT
	and Non-deterministic PDAs	25	Lecture/PPT
	Alternative equivalent definitions of a PDA	26	Lecture/PPT
		27	Revision / Quiz
08	**Module 4:**Context Free Languages	28	Lecture/PPT
	Where do the Context-Free	29	Lecture/PPT
	Languages(CFL) fit,	30	Lecture/PPT
	Showing a language is context-free	31	Lecture/PPT
	Pumping theorem for	32	Lecture/PPT
	CFL, Important closure properties of CFLs	33	Lecture/PPT
	Pumping theorem for	34	Lecture/PPT
	CFL, Important closure properties of CFLs	35	Lecture/PPT
		36	Revision / Quiz
08	**Module 5**:Decidability:	37	Lecture/PPT
	Definition of an algorithm, decidability	38	Lecture/PPT
	P and NP algorithm	39	Lecture/PPT
	decidable languages,	40	Lecture/PPT
	Post correspondence problem	41	Lecture/PPT
	Complexity:	42	Lecture/PPT
	Growth rate of functions	43	Lecture/PPT
	Undecidable languages, halting problem of TM	44	Revision / Quiz

Course Teaching Materials:
Teaching materials such as Notes, PPT, Videos, etc. to be attached

Module No.	Course Teaching Materials	Links
1	Notes	Hand written notes are circulated among students
2	Notes	
3	Notes	
4	Notes	
5	Notes	

Question Bank:

1. Module wise Question bank is enclosed Course file execution

Textbooks:

1. Elaine Rich, Automata, Computability and Complexity, 1st Edition, Pearson

education,2012/2013
2. K L P Mishra, N Chandrasekaran , 3rd Edition, Theory of Computer Science, PhI, 2012.
Reference Books:

1. John E Hopcroft, Rajeev Motwani, Jeffery D Ullman, Introduction to AutomataTheory, Languages, and Computation, 3rd Edition, Pearson Education, 2013
2. Michael Sipser : Introduction to the Theory of Computation, 3rd edition, Cengage learning,2013
3. John C Martin, Introduction to Languages and The Theory of Computation, 3rd Edition, Tata McGraw –Hill Publishing Company Limited, 2013
4. Peter Linz, "An Introduction to Formal Languages and Automata", 3rd Edition, Narosa Publishers, 1998
5. Basavaraj S. Anami, Karibasappa K G, Formal Languages and Automata theory, Wiley India, 2012
6. C K Nagpal, Formal Languages and Automata Theory, Oxford University press, 2012.

Course Outcomes:

After studying this course, students will be able to:

1. Explain and Design the Core Concepts of Automata theory and Computations.
2. Explain Regular Expression, Regular Grammar, properties of Regular Language and use Pumping Lemma to solve the problems
3. Design and simplify Context Free Grammar ,Parse Tree and Push Down Automata
4. Explain CFL and its Properties and Design aTuring Machine for given Language
5. Determine the decidability and intractability of Computational problems

CO-PO Matrix:

ATC (18CS54)	**PO1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**
C504.1	2	2	3									1	1	
C504.2	3	1	2									1	1	
C504.3	1	2	3									1	1	
C504.4	3	1	2									1	1	
C504.5	3											1	1	