FR. CONCEICAO RODRIGUES COLLEGE OF ENGINEERING

Father Agnel Ashram, Bandstand, Bandra (West), Mumbai-50.

Department of Information Technology

B.E. (I.T.) (Semester IV) (2019-2020)

Lecture Plan

Subject: Automata Theory **Credits: 04**

Syllabus:

Course Code	Course Name	Credits
ITC405	Automata Theory	04

Module	Detailed Contents	Hrs
I	**Introduction and Regular Languages:** Languages: Alphabets and Strings. Regular Languages: Regular Expressions, Regular Languages, Regular Grammars, RL and LL grammars, Closure properties	06
II	**Finite Automata and machines:** Finite Automata: FA as language acceptor or verifier, NFA (with and without ε), DFA, RE to NFA, NFA to DFA, Reduced DFA, NFA-DFA equivalence, FA to RE. Finite State Machines: m/c with output Moore and Mealy machines. M/c as translators. Mealy and Moore m/c conversion	09
III	**Context Free Grammars:** Context Free Languages: CFG, Leftmost and Rightmost derivations, Ambiguity, Simplification and Normalization (CNF) and Chomsky Hierarchy (Types 0 to 3)	08
IV	**Push Down Automata:** Deterministic (single stack)PDA, Equivalence between PDA and CFG.	05
V	**Turing Machine:** Deterministic TM, Multi-track and Multi-tape TMs, concept of UTM and idea of system program. Issue and concept of Halting Problem	07
VI	**Application s of Automata:** 1.Power and Limitations of Regular and Context Free Grammars and Machines 2.Designing Functions: FA: Acceptor and Verifier. FSM: Translator PDA: Simple Parser for WF parenthesis, palindromes etc. TM: Basic bit wise calculator(+ /- /AND/OR) and Translator	04

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Text books

1. J.C.Martin, "Introduction to languages and the Theory of Computation", TMH.
2. Kavi Mahesh, "Theory of Computation A Problem Solving Approach", Wiley India

References

1. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, "Introduction to Automata Theory, Languages and Computation", Pearson Education.
2. Daniel I.A. Cohen, "Introduction to Computer Theory", John Wiley & Sons.
3. Theory of Computation - By Vivek Kulkarni from Oxford University.
4. N. Chandrashekhar & K.L.P. Mishra, "Theory of Computer Science, Automata Languages & Computations", PHI publications.

Assessment:

Internal Assessment for 20 marks:

Consisting of Two Compulsory Class Tests

Approximately 40% to 50% of syllabus content must be covered in First test and remaining 40% to 50% of syllabus contents must be covered in second test.

End Semester Examination:

Some guidelines for setting the question papers are as:

- Weightage of each module in end semester examination is expected to be/will be proportional to number of respective lecture hours mentioned in the syllabus.
- Question paper will comprise of total **six questions, each carrying 20 marks**.
- **Q.1** will be **compulsory** and should **cover maximum contents of the syllabus**.
- **Remaining question will be mixed in nature** (for example if Q.2 has part (a) from module 3 then part (b) will be from any other module. (Randomly selected from all the modules.)
- Total **four questions** need to be solved.

Outcomes:

CO1	Understand, design, construct, analyze and interpret Regular languages, Expression and Grammars.
CO2	Design different types of Finite Automata and Machines as Acceptor, Verifier and Translator.
CO3	Understand, design, analyze and interpret Context Free languages, Expression and Grammars.

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CO4	Design different types of Push down Automata as Simple Parser.
CO5	Design different types of Turing Machines as Acceptor, Verifier, Translator and Basic computing machine.
CO6	Compare, understand and analyze different languages, grammars, Automata and Machines and appreciate their power and convert Automata to Programs and Functions.

CO-PO and CO-PSO Mapping

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	2	1						1			2	1	2
CO2	1	3	3						1			2	1	1
CO3	1	2	3						1			2	2	1
CO4	1	3	3	2					2			2	2	1
CO5	1	3	3	2					2			2	2	1
CO6	2	1							2			1	1	2

1-Low Correlation (Low), 2 – Medium Correlation (Medium), 3 – High Correlation (High)

CO Assessment Tools with Target

Course Outcome	Direct Methods				Indirect Method
	Test 1	Test 2	Tutorials	University Result	Course Exit Survey
CO1	**50%**		**25%**	**25%**	**100%**
CO2	**50%**		**25%**	**25%**	**100%**
CO3		**25%**	**25%**	**50%**	**100%**
CO4		**25%**	**25%**	**50%**	**100%**
CO5		**25%**	**25%**	**50%**	**100%**
CO6		**25%**	**25%**	**50%**	**100%**

Lecture Plan:

No. of Lectures Planned:	32	**No. of Classes Taken:**	

Sr. No.	Topic Planned	Planned Date	Actual Date	Delivery Mechanisms
1	Languages: Alphabets and Strings. Regular Languages: Regular Expressions	06/01/20		Board
2	Regular Languages, Regular Grammars	07/01/20		Board
3	RL and LL Grammar, Closure Properties	08/01/20		Board

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4	Finite Automata: FA as language acceptor or verifier	13/01/20		Board
5	NFA (with and without ε)	14/01/20		Board
6	DFA, RE to NFA	15/01/20		Board
7	NFA to DFA	21/01/20		Board
8	Reduced DFA , NFA-DFA equivalence	23/01/20		Board
9	FA to RE	24/01/20		Board
10	M/c with output Moore Machine	28/01/20		Board
11	Mealy machines	30/01/20		Board
12	M/c as translators	31/01/20		Board
13	Mealy and Moore m/c conversion	04/02/20		Board
14	CFG	06/02/20		Board
15	Leftmost and Rightmost derivations	07/02/20		Board
16	Ambiguity	11/02/20		Board
17	Simplification	13/02/20		Board
18	Normalization (CNF)	14/02/20		Board
19	Normalization (GNF)	25/02/20		Board
20	Chomsky Hierarchy (Types 0 to 3)	03/03/20		Board
21	Deterministic (single stack)PDA	05/03/20		Board
22	Deterministic (single stack)PDA	06/03/20		Board
23	Equivalence between PDA and CFG	12/03/20		Board
24	Deterministic TM	13/03/20		Board
25	Deterministic TM	17/03/20		Board
26	Multi-track and Multi-tape TMs	19/03/20		Board
27	Concept of UTM and idea of system program	24/03/20		Board
28	Issue and concept of Halting Problem	26/03/20		Board
29	Power and Limitations of Regular and Context Free Grammars and Machines	27/03/20		Board
30	FA: Acceptor and Verifier. FSM: Translator	31/03/20		Board
31	PDA: Simple Parser for WF parenthesis, palindromes etc	02/04/20		Board
32	TM: Basic bit wise calculator(+ /- /AND/OR) and Translator	03/04/20		Board

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Tutorial Plan:

No. of Tutorials Planned:		**No. of Tutorials Taken:**		
Sr. No.	**Topic Planned**	**Planned Date**	**Actual Date**	**Method of Conduct**
1	Design of RE, Conversion of RE to €-NFA	24/01/20		Class Tutorial + Online Quiz
2	DFA, Minimization of DFA	31/01/20		Class Tutorial + Online Quiz
3	Moore and Mealy Machines	07/02/20		Class Tutorial + Online Quiz
4	CFG, Leftmost and Rightmost Derivations, Parse Tree	14/02/20		Class Tutorial + Online Quiz
5	CFG to CNF and GNF	06/03/20		Class Tutorial + Online Quiz
6	PDA	13/03/20		Class Tutorial + Online Quiz
7	TM	27/03/20		Class Tutorial + Online Quiz
8	Applications of Automata	03/04/20		Online Quiz