BANGALORE UNIVERSITY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING, UVCE, BENGALURU
B.Tech. PROGRAMME IN COMPUTER SCIENCE AND ENGINEERING

Course Code	**18CIPC402**					
Category	Engineering Science Courses : Professional Core					
Course title	**FINITE AUTOMATA AND FORMAL LANGUAGES – THEORY**					
Scheme and Credits	No. of Hours/Week					Semester - IV CSE/ISE
	L	T	P	SS	Credits	
	4	0	0	0	4	
CIE Marks: 50	SEE Marks: 50		Total Max. Marks: 100			Duration of SEE: 03 Hours
Prerequisites (if any): NIL						

COURSE OBJECTIVES:

The course will enable the students to

1. Design Deterministic finite automata, Nondeterministic finite automata, conversion of NFA to DFA, design of E- NFA and regular expressions.
2. Obtain minimized DFA and convert automata to regular expressions and regular expression to automata and proving languages are not regular.
3. Writing CFG's, Construction of parse trees, understand ambiguity in grammars, designing problems on Pushdown Automata.
4. Conversion of grammar to Chomsky Normal Form, Greibach normal form and conversion of grammar to PDA. Prove that languages are not context free using pumping lemma.
5. Designing turing machines, understanding the working of turing machines and solving post correspondence problems.

UNIT I: INTRODUCTION TO FINITE AUTOMATA 10 Hours

The central concepts of Automata theory; Deterministic finite automata; Nondeterministic finite automata An application of finite automata; Finite automata with Epsilon transitions; Regular expressions.

UNIT II: REGULAR EXPRESSIONS & REGULAR LANGUAGES 10 Hours

Finite Automata and Regular Expressions; Applications of Regular Expressions. Regular languages; Proving languages not to be regular languages; Closure properties of regular languages; Decision properties of regular languages; Equivalence and minimization of automata.

UNIT III: CONTEXT-FREE GRAMMARS AND LANGUAGES, PUSH DOWN AUTOMATA 10 Hours

Context–free grammars; Parse trees; Applications; Ambiguity in grammars and Languages. Definition of the Pushdown automata; The languages of a PDA.

UNIT IV: PROPERTIES OF CONTEXT-FREE LANGUAGES 09 Hours

Equivalence of PDA's and CFG's; Deterministic Pushdown Automata., Normal forms for

CFGs; The pumping lemma for CFGs; Closure properties of CFLs.

UNIT V: TURING MACHINE & UNDECIDABILITY **09 Hours**

The Turing machine; Programming techniques for Turing Machines; Extensions to the basic Turing Machines; A Language that is not recursively enumerable; An Undecidable problem that is RE; Post's Correspondence problem.

TEXT BOOKS:

1. John E. Hopcroft, Rajeev Motwani, Jeffrey D.Ullman: Introduction to Automata Theory, Languages and Computation, 3rd Edition, Pearson education, 2007.

REFERENCE BOOKS:

1. Raymond Greenlaw, H.James Hoover: Fundamentals of the Theory of Computation, Principles and Practice, Morgan Kaufmann, 1998.
2. John C Martin: Introduction to Languages and Automata Theory, 3rd Edition, Tata McGraw-Hill, 2007.
3. Daniel I.A. Cohen: Introduction to Computer Theory, 2nd Edition, John Wiley & Sons, 2004.
4. Thomas A. Sudkamp: An Introduction to the Theory of Computer Science, Languages and Machines, 3rd Edition, Pearson Education, 2006.

e-BOOKS/ONLINE RESORCES:

1. Foundations of Computation-CAROL CRITCHLOW, DAVID ECK.

MOOCs:

1. www.nptel/videos.in/2012/11/theory-of-computation.html.
2. nptel.ac.in/courses/106104028/theory of computation.

COURSE OUTCOMES:

The students at the end of the course, will be able to

CO1: Design finite automata and NFA for given languages.
CO2: Write regular expressions for given languages and properties of regular languages.
CO3: Convert finite automata to regular expressions and vice versa.
CO4: Design context free grammar for specified language and Design Push Down Automata.
CO5: Analyze Turing Machine and undecidability problem.

SCHEME OF EXAMINATION:

<table>
<tr><td rowspan="2">CIE – 50 Marks</td><td>Test I (Any Three Units) - 20 Marks</td><td>Quiz I – 5 Marks</td><td>25 Marks</td><td rowspan="2">Total: 50 Marks</td></tr>
<tr><td>Test II (Remaining Two Units) - 20 Marks</td><td>Quiz II – 5 Marks</td><td>25 Marks</td></tr>
<tr><td rowspan="3">SEE – 100 Marks</td><td colspan="2">Q1 (Compulsory): MCQs or Short answer type questions for 15 Marks covering entire syllabus.</td><td>15 Marks</td><td rowspan="3">Total: 100 Marks</td></tr>
<tr><td colspan="2">Q2 & Q3 from Units which have 09 Hours are compulsory.</td><td>17 * 2 = 34 Marks</td></tr>
<tr><td colspan="2">Q4 or Q5, Q6 or Q7 and Q8 or Q9 from Units which have 10 Hours shall have Internal Choice.</td><td>17 * 3 = 51 Marks</td></tr>
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Note: SEE shall be conducted for 100 Marks and the Marks obtained is scaled down to 50 Marks.

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