FORMAL LANGUAGES AND AUTOMATA THEORY

B.Tech. III Year I Semester								
Course Code	Category	Hours / Week			Credits	Maxumum Marks		
CS3101PC	Core	L	T	P	C	CIA	SEE	Total
		3	0	0	3	25	75	100
Contact classes: 60	Tutorial Classes : NIL	Practical classes : NIL				Total Classes :60		
Prerequisite: A course on "Discrete Mathematics"								

Course Objectives

- To provide introduction to some of the central ideas oftheoreticalcomputer science from the perspective of formal languages.
- Tointroducethefundamentalconceptsofformallanguages,grammarsandautomata theory.
- Classifymachinesbytheir powertorecognizelanguages.
- Employfinitestatemachinestosolveproblemsincomputing.
- Tounderstanddeterministicandnon-deterministicmachines.
- Tounderstandthedifferencesbetweendecidabilityand undecidability.

Course Outcomes

- Abletounderstandtheconceptofabstractmachinesandtheirpowertorecognizethe languages.
- Abletoemployfinitestatemachinesformodelingandsolvingcomputingproblems.
- Abletodesigncontextfreegrammars forformal languages.
- Abletodistinguishbetweendecidabilityandundecidability.
- Abletogainproficiencywith mathematicaltoolsandformalmethods.

MODULE-I

Introductionto Finite Automata: Structural Representations, Automata and Complexity, the Central Concepts of Automata Theory–Alphabets, Strings, Languages, Problems.

Nondeterministic Finite Automata: Formal Definition, an application, Text Search, Finite Automata with Epsilon-Transitions.

DeterministicFiniteAutomata: DefinitionofDFA,HowaDFAProcessStrings,The languageofDFA,ConversionofNFAwith€-transitionstoNFAwithout€-transitions.

ConversionofNFAto DFA,Mooreand Melaymachines.

MODULE-II

Regular Expressions: Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Conversion of Finite Automata toRegular Expressions.

Pumping Lemma for Regular Languages: Statement of the pumping lemma, Applications of the Pumping Lemma.

Closure Properties of Regular Languages: Closure properties of Regular languages, Decision Properties of Regular Languages, Equivalence and Minimization of Automata.

MODULE-III

Context-Free Grammars: Definition of Context- Free Grammars, Derivations Using a Grammar, Left most and Right most Derivations, the Language of a Grammar, Sentential Forms, Parse Tress, ApplicationsofContext-FreeGrammars,Ambiguityin GrammarsandLanguages.

Push Down Automata: Definition of the Push down Automaton, the Languages of a PDA, Equivalence of PDA's and CFG's, Acceptance by final state, Acceptance by empty stack, Deterministic Pushdown Automata. From CFG to PDA, From PDA to CFG.

MODULE-IV

Normal Forms for Context-Free Grammars: Eliminating useless symbols, Eliminating €-Productions. Chomsky Normal form, Griebech Normal form.

PumpingLemmaforContext-FreeLanguages: Statementofpumpinglemma, Applications.

ClosurePropertiesofContext-FreeLanguages:ClosurepropertiesofCFL's,Decision Properties of CFL's

TuringMachines:IntroductiontoTuringMachine,FormalDescription,Instantaneousdescription, The language of a Turing machine

MODULE-V

TypesofTuringmachine: Turingmachinesand halting

Undecidability: Undecidability, A Language that is Not Recursively Enumerable, An Undecidable ProblemThat is RE, Undecidable Problems about Turing Machines, Recursive languages, Propertiesofrecursive languages, Post'sCorrespondenceProblem, ModifiedPost Correspondence problem, Other Undecidable Problems, Counter machines.

TEXTBOOKS:

1. IntroductiontoAutomataTheory,LanguagesandComputation,3rd Edition,John E.Hopcroft, Rajeev Motwani, Jeffrey D.Ullman, Pearson Education.
2. TheoryofComputerScience–Automatalanguagesandcomputation,Mishraand Chandrashekaran, 2nd edition, PHI.

REFERENCEBOOKS:

1. Introductionto Languagesand theTheoryofComputation,JohnCMartin,TMH.
2. IntroductiontoComputerTheory,DanielI.A. Cohen,JohnWiley.
3. ATextbookonAutomataTheory,P.K.Srimani,NasirS.F.B,CambridgeUniversityPress.
4. IntroductiontotheTheoryofComputation,MichaelSipser,3rdedition,Cengage Learning.
5. IntroductiontoFormallanguagesAutomataTheoryandComputationKamala Krithivasan, Rama R, Pearson.