Theory of Automata, Formal Languages and Computation - Video course

COURSE OUTLINE

Grammars - Production systems - Chomskian Hierarchy - Right linear grammar and Finite state automata - Context free grammars - Normal forms - uvwxy theorem – Parikh mapping - Self embedding property - Subfamilies of CFL - Derivation trees and ambiguity.

Finite state Automata - Non deterministic and deterministic FSA, NFSA with ε- moves, Regular Expressions - Equivalence of regular expression and FSA .

Pumping lemma , closure properties and decidability. Myhill - Nerode theorem and minimization - Finite automata with output.

Pushdown automata - Acceptance by empty store and final state - Equivalence between pushdown automata and context-free grammars - Closure properties of CFL - Deterministic pushdown automata.

Turing Machines - Techniques for Turing machine construction - Generalized and restricted versions equivalent to the basic model - Godel numbering - Universal Turing Machine - Recursively enumerable sets and recursive sets - Computable functions - time space complexity measures - context sensitive languages and linear bound automata.

Decidability; Post's correspondence problem; Rice's theorem; decidability of membership, emptiness and equivalence problems of languages.

Time and tape complexity measures of Turing machines; Random access machines; the classes P and NP; NP-Completeness; satisfiability and Cook's theorem; Polynomial reduction and some NP-complete problems.

Advanced topics; Regulated rewriting L systems; Grammar systems.

New paradigms of computing; DNA computing; Membrane computing.

COURSE DETAIL

Module No.	Topics	No. of Hours
1	Grammars, Languages generated, Chomskian Hierarchy, CFG, Ambiguity, Reduced grammars, Normal forms	7
2	FSA,NFSA, NFSA with € moves, Regular expressions, Equivalence of regular expression and FSA, Equivalence of type 3 grammars and FSA, Pumping lemma , Closure and decidability results , Myhill-Nerode theorem, Minimization, FSA with output, Problems	11
3	Pushdown Automata, Acceptance by final state and empty store, Equivalence to CFG , Deterministic PDA	4

NP-TEL

NPTEL

http://nptel.iitm.ac.in

Computer Science and Engineering

Pre-requisites:

A basic knowledge in Mathematics. Some knowledge about sets, Relations and function is desirable.

Additional Reading:

1. Peter Linz, "An Introduction to Formal Language and Automata", 4th Edition, Narosa Publishing house , 2006.
2. M.Sipser; Introduction to the Theory of Computation; Singapore: Brooks/Cole, Thomson Learning, 1997.
3. John.C.martin, "Introduction to the Languages and the Theory of Computation",Third edition, Tata McGrawHill, 2003.

Hyperlinks:

www.pearsoned.co.in/KamalaKrithivasan

Coordinators:

Prof. Kamala Krithivasan
Department of Computer Science and EngineeringIIT Madras

4	Problems and Solutions	3
5	Turing Machines - Construction, Techniques of TM construction , TM as acceptor and i/o device , Problems . Generalized and restricted versions.	5
6	Halting problems - Universal TM-recursive and recursively enumerable sets - Decidability - Rice's Theorem , PCP	4
7	Time and Tape complexity of TM , P and NP, Cook's theorem - NP-Complete Problems .	3
8	Advanced topics , Regulated rewritin , L systems Grammar system.	3
9	New Paradigms of computing , DNA computing , Membrane computing	2
Total		**42**

References:

1. K.Krithivasan and R.Rama; Introduction to Formal Languages, Automata Theory and Computation; Pearson Education, 2009.
2. J.E.Hopcroft, R.Motwani and J.D.Ullman , "Introduction to Automata Theory Languages and computation", Pearson Education Asia , 2001.