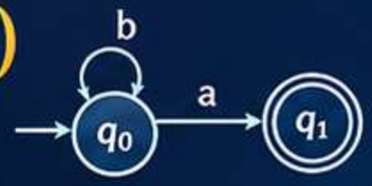
Theory of Automata and Formal Languages (TAFL)



Course Table of Contents — 45 Lecture Series

Module 1: Foundations

Lectures 1–4

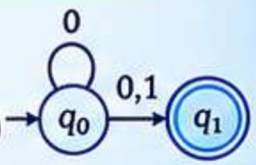
- Introduction to TAFL
- Alphabets, Strings and Languages
- Operations on Languages
- Basic Concepts of Grammars and Machines

$$\Sigma = \{0,1\}$$
$$L \subseteq \Sigma^*$$

Module 2: Finite Automata

Lectures 5–12

- Deterministic Finite Automata (DFA)
- Nondeterministic Finite Automata (NFA)
- ε-NFA
- NFA to DFA Conversion
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Module 3: DFA Analysis and Machines

Lectures 13–24

- DFA Equivalence
- DFA Minimization
- Table Filling Method
- DFA vs Moore Machine
- Mealy Machine
- Moore to Mealy Conversion
- Mealy to Moore Conversion

M
Moore
Mealy

Module 4: Regular Languages and Expressions

Lectures 25–31

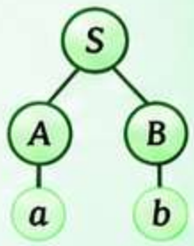
$$(a+b)^*a$$

- Regular Expressions
- Regular Expressions to Finite Automata
- Finite Automata to Regular Expressions
- Properties of Regular Languages
- Pumping Lemma for Regular Languages

Module 5: Context-Free Languages and Grammars

Lectures 32–39

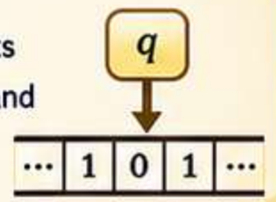
- Pumping Lemma Solved Examples
- Introduction to Context-Free Grammars
- Derivations and Parse Trees
- Ambiguity in Context-Free Grammars
- Simplification of CFGs
- Chomsky and Greibach Normal Forms
- Pushdown Automata and CFG Equivalence
- Properties and Pumping Lemma of CFLs



Module 6: Turing Machines and Computability

Lectures 40–42

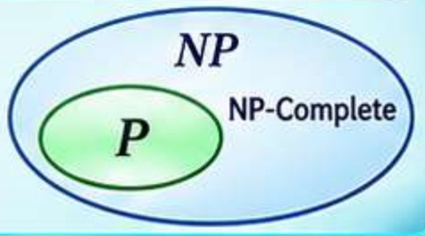
- Turing Machines and Their Variants
- Chomsky Hierarchy, Decidability and Undecidability
- Rice's Theorem and Post Correspondence Problem



Module 7: Complexity Theory

Lecture 43

- P, NP, NP-Hard and NP-Complete



Module 8: Final Revision and Exam Preparation

Lectures 44–45

- Comprehensive TAFL Revision and Comparative Analysis
- Solved Examination Questions and Final Course Summary



45 lectures • From Foundations to Complexity • Complete TAFL Roadmap