North South University

Department of Electrical and Computer Engineering

CSE 273: Introduction to Theory of Computation Course Outline – Spring 2025

Course Outline - CSE 273 Introduction to Theory of Computation

1 Basic Information

Department	Department of Computer Science and Engineering
Programme	Bachelor of Science in Computer Science and Engineering
Course Code	CSE 273
Course Title	*Introduction to Thoery of Computation*
Course Credit	3.0 units
Contact Hours Per Week	3
Instructor	Dr. Md. Mosaddek Khan (MMK1)
Office Location	SAC 1142
Office Hours	Attached as a separate document
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2 Syllabus

Fundamentals: Strings and their properties, Basics of automata, Transition systems. **Formal Languages and the Chomsky Hierarchy:** Regular, Context-Free, Context-Sensitive, Recursively Enumerable. **Finite Automata:** Basics of DFA & NFA, Constructions of DFA, Extended transition function for DFA and NFA, Subset construction, DFA minimization, Equivalence test, Finite Automata with outputs: Mealy and Moore Machines - construction and conversions. **Regular Languages, Regular Expressions, and their relationship:** Constructions of Regular Expressions. **Properties of Regular Languages:** Closure Properties, Arden's Theorem, Pumping Lemma for Regular Languages. **Context-Free Languages and Grammars:** Context-free grammar (CFG) basics and construction, Derivation trees, Ambiguous grammar, Construction of reduced grammar, Elimination of null and unit productions, Normal forms for CFG (CNF & GNF), Pumping Lemma for Context-Free Languages, CYK Algorithm. **Pushdown Automata:** Push down automata (PDA) basics and construction, PDA acceptance by final state and empty stack, PDA transformations, Relationship between Context-Free Languages and PDAs. **Context-Sensitive Languages and Linear Bounded Automata:** Context-sensitive languages (CSL) and construction, Context-sensitive grammars (CSG), Linear bounded automata (LBA), Relationship between CSLs and LBAs. **Turing Machines:** Basics of Turing machines and construction, Decidability and Undecidability, The Halting Problem.

3 Text and Reference Materials

1) **Theory of Computer Science**
   Automata, Languages and Computation, Third Edition
   By K.L.P. Mishra and N.Chadrasekaran
2) **Introduction to Automata Theory, Languages and Computation**
   Second Edition
   By John E. Hopcroft, Rajeev Motwani and Jefrey D. Ullman
3) **Introduction to Languages and The Theory of Computation**
   Third Edition
   By John C. Martin

4 Topic Outline

Topic No.	Content	References
1	Strings and it's Properties, Basics of Automata, Transition Systems	[1],[2]
2	Basics of DFA & NFA, Constructions of DFA[1]	[1],[2]
3	Constructions of DFA [2], Extended Transition Function for DFA and NFA.	[2]
4	Subset Construction ,DFA minimization and Equivalence Test.	[2]
5	Basics and Transformation of Mealy Machine and Moore Machine.	[1]
6	Regular Language, Regular Expressions, Regular Grammar, Closure Properties, Arden's Theorem.	[1],[2]
7	Transformation of Finite Automata to Regular Expression and vice versa.	[1]
8	Pumping Lemma and Chomsky Classification.	[1],[2],[3]
9	Context Free Language, Context Free Grammar, Derivation Trees, Ambiguous Grammar.	[1],[2]
10	Construction of Reduced Grammar, Elimination of Null and Unit Productions.	[1],[2]
11	Normal Forms for CFG[CNF & GNF]	[1],[2]
12	Push Down Automata Basics and Examples.	[1],[2],[3]
13	PDA acceptance by Final State and Empty Stack and Their Transformations.	[2]
14	CYK Algorithm, Transformation from CFG to PDA.	[2]
15	Basics of Turing Machine and Examples.	[1],[2],[3]

Note: Refrence [1] means Book Number 1 given in the previous page.