Stamford University Bangladesh
Department of Computer Science and Engineering (CSE)
Course Outline

Course Code	**:** CSI 315	**Trimester**	**:**	Fall 2019
Course Title	**:** Theory of Computing	**Course Level**	**:**	L3T2
Credit Hours	**:** 3.0 Hours/Week	**Program**	**:**	CSE
Prerequisite	**:** None			

Course Teacher	❖ **Taslim Taher** Assistant Professor taslimstamford@gmail.com	❖ **Mehedi Hasan** Lecturer mhj.cse@gmail.com
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Course Objective	The objective of this course is to learn how to construct finite state machines and the equivalent regular expressions where students will be able to prove the equivalence of languages described by finite state machines and regular expressions. This course teaches the pushdown automata and the equivalent context free grammars, the equivalence of languages described by pushdown automata and context free grammars, Turing machines and Post machines. The students also learn about NP-Hard Problem in this course.

Textbook	1. **Introduction to Automata theory, Languages and Computation**, Hopcroft, Rajeev, Ullman, 5th edition.

Reference Books	1. **Introduction to Theory of Computation**, by Michael Sipser, 3rd Edition, published by Thomson. 2. **Introduction to Languages and Theory of Computation**, by John C Martin, 3rd Edition, published by McGraw-Hill.

Lesson Plan	*Week*	*Lecture*	*Topic*	*Textbook/ References*
	Week-1	1	• What is Automata Theory, • Languages and Grammars, Alphabet, Strings, Powers of alphabets, Languages • Finite Automata Examples	(Ch. 1)
		2	• Definition of a Deterministic Finite Automata, how a DFA	(Ch. 2)

			• processes string, Examples of DFA • Extending Transition Function to Strings, Extending Transition Function to Strings, Examples of Extending Transition Function	
	Week-2	3	• Definition of a Non-Deterministic Finite Automata, Language of NFA • Designing of NFA, Equivalence of DFA and NFA • Applications of Finite Automata	(Ch. 2)
		4	• **Class Test-1** • Finite Automata with Epsilon Transitions • Eliminating Epsilon Transitions	(Ch. 2)
	Week-3	5	• What is Regular Expression, Use of Regular expressions • Applications of Regular expressions • Operators of Regular Expressions, Building Regular Expressions, Precedence of RE operators	(Ch. 3)
		6	• Converting a DFA to a regular expression • Regular Expression in Unix • Lexical Analysis, • Algebraic law for Regular Languages-Associativity and Commutatively, Identities and Annihilators, The idempotent law	(Ch. 3)
	Week-4	7	• **Class Test-2** • Properties of Regular Languages • The Pumping Lemma for Regular Languages.	(Ch. 4)
		8	• Closure under Union • Closure under complementation Intersection, Difference, Reversal	(Ch. 4)
	Week-5	9	• Definition of Context Free Grammars, CFG Notation • Recursive Inference using CFG • Left-most and Right most Derivations	(Ch. 5)

			Content	
			• Language of a Context Free Grammar	
		10	• CFG Exercises, Constructing Parse Tree, Applications of CFG • Ambiguous Grammar, Removing Ambiguity • Applications of Ambiguous Grammar	(Ch. 5)
	Week-6	11	• Normal Forms for Context free Grammars • Eliminating Useless Symbols • Eliminating Epsilon Productions.	(Ch. 7)
		12	• Eliminating Unit Productions • Chomsky Normal Form	(Ch. 7)
	Week-7	13	• Cont'd • Closure Properties of CFL	
		14	• Review of Mid Exam Syllabus	
	Mid Term Examination			
	Week-8	15	• Definition of a Pushdown Automata, The Formal definition of PDA • A Graphical Notation for PDA • Instantaneous Description of PDA.	(Ch. 6)
		16	• The Languages of a PDA • Acceptance by Final State.	(Ch. 6)
	Week-9	17	• Cont'd	
		18	• Introduction to Turing Machines • Notation for the Turing Machine,	(Ch. 8)
	Week-10	19	• Cont'd • Turing Machines and Halting.	(Ch. 8)
		20	• **Class Test-3**	
	Week-11	21	• Recursive Languages • Complements of Recursive and RE languages	(Ch. 9)
		22	• Cont'd	(Ch. 9)
	Week-12	23	• Nondeterministic Polynomial Time • An NP Example-TSP	(Ch. 10)
		24	• Cont'd	(Ch. 10)
	Week-13	25	• NP Complete Problems • Satisfiability Problem	(Ch. 10)
		26	• Review of Final Exam	
	Final Examination			

Learning Activities	Problem discussion, Class tests, Assignments, Examinations etc.

Assessment	Attendance	10%
	Class Tests	10%+10%
	Assignments	5%+5%
	Mid-term Exam	30%
	Final Exam	30%

Grade References	Percentage	Letter Grade	Grade Point
	80% or above	A+	4.00
	75% to less than 80%	A	3.75
	70% to less than 75%	A-	3.50
	65% to less than 70%	B+	3.25
	60% to less than 65%	B	3.00
	55% to less than 60%	B-	2.75
	50% to less than 55%	C+	2.50
	45% to less than 50%	C	2.25
	40% to less than 45%	D	2.00
	Less than 40%	F	0.00

Plagiarism Policy	Any form of unfair means is strictly prohibited in the exams/assignment

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