UNITED INTERNATIONAL UNIVERSITY

Department of Computer Science and Engineering (CSE)

Course Syllabus

1	**Course Title**	Theory of Computation / Theory of Computing
2	**Course Code**	CSE 2233 / CSI 233
3	**Trimester and Year**	Fall 2024
4	**Pre-requisites**	Algorithms, CSI-227, Algorithms Laboratory, CSI-228
5	**Credit Hours**	3.0
6	**Section**	C, H
7	**Class Hours**	(Sec-H) Saturday and Tuesday (01:51pm - 03:10pm) (Sec-C) Sunday and Wednesday (11:11am - 12:30pm)
8	**Class Room**	323 (Sec-H) 330 (Sec-C)
9	**Instructor's Name**	Md. Muhyminul Haque, Lecturer, Dept. of CSE, UIU
10	**Contact Info**	Email: muhyminul@cse.uiu.ac.bd Phone: +8801789926815 (In case of emergency only)
11	**Office**	Room: 419-D
12	**Counselling Hours**	See table below
13	**Text Book**	***Introduction to Automata Theory, Languages, and Computation***, by John Hopcroft, Rajeev Motwani, and Jeffrey Ullman
14	**Reference**	1. http://infolab.stanford.edu/~ullman/ialc.html 2. Introduction to the Theory of Computation (2nd ed. 2006). by Michael Sipser 3. Languages and Machines: An Introduction to the Theory of Computer Science.(3rd ed), by Thomas Sudkamp

Day	Time [CNH]
Saturday	08:30 AM – 11:10 AM, 12:31 PM – 01:50 PM
Sunday	08:30 AM – 11:10 AM
Monday	-
Tuesday	08:30 AM – 11:10 AM, 12:31 PM – 01:50 PM
Wednesday	08:30 AM – 11:10 AM, 12:31 PM – 02:00 PM

15	**Course Contents (approved by UGC)**	Basic concepts of Finite Automata and Languages: Alphabet, String, Language; Finite Automata: Deterministic Finite Automata, Nondeterministic Finite Automata, Equivalence of Deterministic and Nondeterministic Finite Automata, Finite Automata With Epsilon Transitions, Minimization of Automata; Regular Expressions: Regular Expression & it's Application, Equivalence of Finite Automata and Regular Expressions; Context-Free Grammars: Application of CFG, Parse Tree, Ambiguity in Grammars and Languages, Normal Forms for Context-Free Grammars; Pushdown Automaton: Languages of a PDA, Equivalence of PDA's and CFG's, Deterministic Pushdown Automata; Introduction to Turing Machine; Intractable Problems: NP completeness.
16	**Course Outcomes (COs)**	

COs	Description
CO1	Acquire a fundamental understanding of the core concepts in automata theory and formal languages.
CO2	An ability to design grammars, regular expression and automata for different language classes.
CO3	An ability to identify formal language classes and its properties.
CO4	Acquire a fundamental understanding of core concepts relating to the theory of computation and computational models including decidability and intractability.

17	**Teaching Methods**	Lecture, Class Test , Assignment, Q/A
18	**CO with Assessment Methods**	

CO	Assessment Method	(%)
-	Attendance	5
-	Assignments	5
-	Class Tests	20
1, 3	Midterm exam	30
2, 3, 4	Final exam	40

19 **Mapping of COs and Program outcomes**

COs	Program Outcomes(POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	C											
CO2			C									
CO3		C										
CO4		C										

20 **Lecture Outline**

Class	Topics/Assignments	COs	Reading Reference	Lecture Outcomes/ Activities
1	Basic concepts of finite automata and languages	1	Ch1	Lecture, Q/A
2	Alphabet, String and Language	1	Ch1	Lecture, Q/A
3, 4	Deterministic Finite Automata	1, 2	Ch2	Lecture, Assignment
5	Nondeterministic Finite Automata	1, 2	Ch2	Lecture, Quiz
6	Equivalence of Deterministic and Nondeterministic Finite Automata	3	Ch2	Lecture, Q/A, HW
7	Finite Automata With Epsilon-Transitions	1, 2	Ch2	Lecture, Q/A, HW
8, 9	Regular Expressions	2	Ch3	Lecture, Assignment
10, 11	Finite Automata and Regular Expressions	2, 3	Ch3	Lecture, HW, Quiz
12	The Pumping Lemma for Regular Languages	3	Ch4	Lecture
	MIDTERM EXAM			
13	Closure Properties of Regular Languages Decision Properties of Regular Languages	3	Ch4	Lecture, Q/A
14	Equivalence and Minimization of Automata	3	Ch4	Lecture, Assignment
15	Context-Free Grammars	2	Ch5	Lecture, Q/A
16	Parse Trees	2	Ch5	Lecture, Q/A
17	Ambiguity in Grammars and Languages	2, 3	Ch5	Lecture, Quiz
18	Definition of the Pushdown Automaton	4	Ch6	Lecture, Q/A
19	The languages of a PDA	3, 4	Ch6	Lecture, Q/A
20	Equivalence of PDA's and CFG's	4	Ch6	Lecture, HW, Q/A
21	Deterministic Pushdown Automata	4	Ch6	Lecture, HW, Q/A
22	Normal Forms for Context-Free Grammars	3	Ch7	Lecture, HW, Q/A

		23	Introduction to Turing Machine	4	Ch8	Lecture, Quiz	
		24	Intractable Problems and NP completeness	4	Ch10	Lecture, Q/A	

Appendix 1: Assessment Methods

Assessment Types	Marks
Attendance	5%
Assignments	5%
Class Tests	20%
Mid Term	30%
Final Exam	40%

Appendix 2: Grading Policy

Letter Grade	Marks %	Grade Point	Letter Grade	Marks%	Grade Point
A (Plain)	90-100	4.00	C+ (Plus)	70-73	2.33
A- (Minus)	86-89	3.67	C (Plain)	66-69	2.00
B+ (Plus)	82-85	3.33	C- (Minus)	62-65	1.67
B (Plain)	78-81	3.00	D+ (Plus)	58-61	1.33
B- (Minus)	74-77	2.67	D (Plain)	55-57	1.00
			F (Fail)	<55	0.00

Appendix-3: Program outcomes

POs	Program Outcomes
PO1	An ability to apply knowledge of mathematics, science, and engineering
PO2	An ability to identify, formulate, and solve complex engineering problems
PO3	An ability to design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations
PO4	An ability to investigate complex problems using research-based knowledge and research methods design and conduct experiments, as well as to analyze and interpret data
PO5	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
PO6	The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
PO7	Understand and evaluate the sustainability and impact of professional engineering work in the solution of complex engineering problems in societal and environmental contexts
PO8	An understanding of professional and ethical responsibility
PO9	An ability function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings
PO10	An ability to communicate effectively
PO11	Project management and finance
PO12	A recognition of the need for, and an ability to engage in life-long learning