



**AMERICAN INTERNATIONAL UNIVERSITY-
BANGLADESH (AIUB)**
Faculty of Science and Technology (FST)
Department of Computer Science (CS)
Undergraduate Program

COURSE PLAN

SEMESTER: Fall 2023-2024

I. Course Code and Title:

CSC 3113: Theory of Computation

II. Credit:

3 Hour Theory per week

III. Nature

Core Course for CSE

IV. Prerequisite

CSC 2211: Algorithms

V. Vision:

Our vision is to be the preeminent Department of Computer Science through creating recognized professionals who will provide innovative solutions by leveraging contemporary research methods and development techniques of computing that is in line with the national and global context.

VI. Mission:

The mission of the Department of Computer Science of AIUB is to educate students in a student-centric dynamic learning environment; to provide advanced facilities for conducting innovative research and development to meet the challenges of the modern era of computing, and to motivate them towards a life-long learning process.

VII - Course Description:

- Understanding the notations used in computer science literature
- Understanding the mathematical model of Computation.
- Use of Computational models to solve problems
- Understanding Computability
- Determining Complexity of problems

VIII - Course outcomes (CO) Matrix:

By the end of this course, students should be able to:

COs*	CO Description	Level of Domain***			PO Assessed****
		C	P	A	
CO1	Describe different computational model and mathematical notations	3			PO-a-2
CO2	Give original example of different computational model and mathematical notations	3			PO-a-2
CO3**	Design a solution for a complex problem using the principles of existing computational models	4			PO-c-3
CO4**	Modify a solution using the principles of existing computational model.			4	PO-l-2

C: Cognitive; P: Psychomotor; A: Affective Domain

* CO assessment method and rubric of COs assessment is provided in later section

** COs will be mapped with the Program Outcomes (POs) for PO attainment

*** The numbers under the 'Level of Domain' columns represent the level of Bloom's Taxonomy each CO corresponds to.

**** The numbers under 'PO Assessed' column represent the POs each CO corresponds to.

IX - Topics to be covered in the class and/or lab: *

Time Frame	CO Mapped	Topics	Teaching Activities	Assessment Strategy(s)
Week 1	CO1, CO2	Mission & Vision of AIUB, Basic Mathematical Concepts Finite Automaton, Deterministic Finite Automaton (DFA)	Discussion on Mission & Vision of AIUB, Introduction to Theory of Computation Review of Pre-requisite study materials, perform of exercises	
Week 2	CO3, CO4	DFA	Discussion, Group study and perform of exercises, PPT slides, board work	Group study, Homework, Quiz
Week 3		Non-determinism and Non-regular languages	Discussion, Group study and perform of exercises, PPT slides, board work	
Week 4	CO1, CO2	Regular Expression	Discussion, Group study and perform of exercises	Pop Quiz, Class discussion, question answer session, Home work
Week 5	CO1, CO2	Context free Languages	Discussion, Group study and perform of exercises	Pop Quiz, Class discussion, question answer session, Home work
Week 6	CO3	Ambiguous Grammar, Chomsky Normal Form, Push Down Automata	Discussion, Group study and perform of exercises, PPT slides, board work	Quiz, Class discussion, question answer session
Week 7		Push Down Automata, Review	Discussion, Group study and perform of exercises, PPT slides, board work	
Midterm (Week 8)				
Week 9		Turing Machine	Discussion, Group study and perform of exercises, PPT slides, board work	Pop Quiz, Class discussion, question answer session
Week 10		Turing Machine	Discussion, Group study and perform of exercises, PPT slides, board work	Pop Quiz, Class discussion, question answer session
Week 11		Turing Machine	Discussion, Group study and perform of exercises, PPT slides, board work	Pop Quiz, Class discussion, question answer session
Week 12		Turing Machine	Discussion, Group study and perform of exercises, PPT slides, board work	Pop Quiz, Class discussion, question answer session

Week 13		Decidability and Undecidability	Discussion, Group study and perform of exercises, PPT slides, board work	Quiz, Class discussion, question answer session
Week 14		Decidability and Undecidability	Discussion, Group study and perform of exercises, PPT slides, board work	Quiz, Class discussion, question answer session
Week 15		Decidability and Undecidability	Discussion, Group study and perform of exercises, PPT slides, board work	Quiz, Class discussion, question answer session
Final term (Week 16)				

* The faculty reserves the right to change, amend, add, or delete any of the contents.

X - Mapping of PO to Courses and K, P, A

PO Indicator ID	PO Indicators Definition (As per the requirement of WKs)	Domain	K	P	A
PO-c-3	Develop computer science and engineering solutions that meet specified needs with appropriate environmental considerations.	Cognitive Level 4 (Analyzing)	K5	P1 P2 P6	
PO-l-2	Seek and use resources in solving computer science and engineering problems.	Affective Level 4 (Organizing)			

XI – K, P, A Definitions

Indicator	Title	Description
K5	Engineering Design	Knowledge that supports engineering design in a practice area
P1	Depth of knowledge required	Cannot be resolved without in-depth engineering knowledge at the level of one or more of K3, K4, K5, K6 or K8 which allows a fundamentals-based, first principles analytical approach
P2	Range of conflicting requirements	Involve wide-ranging or conflicting technical, engineering, and other issues
P6	Extent of stakeholder involvement and conflicting requirements	Involve diverse groups of stakeholders with widely varying needs

XII – Mapping of CO Assessment Method and Rubric

The mapping between Course Outcome(s) (COs) and The Selected Assessment method(s) and the mapping between Assessment method(s) and Evaluation Rubric(s) is shown below:

COs	Description	Mapped POs	Assessment Method	Assessment Rubric
CO1	Describe different computational model and mathematical notations	PO-a-2	Quiz	Rubric for Quiz
CO2	Give original example of different computational model and mathematical notations	PO-a-2	Quiz	Rubric for Quiz
CO3	Design a solution for a complex problem using the principles of existing computational models	PO-c-3	Mid term Exam	Rubric for Term exam
CO4	Modify a solution using the principles of existing computational model.	PO-l-2	Mid term Exam	Rubric for Term exam

XIII – Evaluation and Assessment Criteria

CO1: Describe different computational model and mathematical notations					
Assessment Criteria	Not Attended/ Incorrect (0)	Inadequate (1-2)	Average (3)	Good (4)	Excellent (5)
Evaluation Criteria	Evaluation Definition				
Definition	Student knows the proper definition/ usage of a mathematical model.				
Logical Argument	Student can relate the theory with the given problem statement.				
Relevant Example	Students can provide a real life example.				

CO2: Give original example of different computational model and mathematical notations					
Assessment Criteria	Not Attended/ Incorrect (0)	Inadequate (1-2)	Average (3)	Good (4)	Excellent (5)
Evaluation Criteria	Evaluation Definition				
Definition	Student can Comprehensively define the terms.				
Logical Arguments	Student can provide Comprehensive argument presented to clarify the concept.				
Relevant Example	Students can defend the argument with real life example.				

CO3: Design a solution for a complex problem using the principles of existing computational models					
Assessment Criteria	Not Attended/ Incorrect (0)	Inadequate (1-2)	Average (3)	Good (4)	Excellent (5)
Evaluation Criteria	Evaluation Definition				
Design	Student can Comprehensively design the solution.				
Design Conventions	Student can follow the conventions perfectly				
Result Analysis	Students can relate/ analyze his design with the conventions.				

CO4: Modify a solution using the principles of existing computational model.					
Assessment Criteria	Not Attended/ Incorrect (0)	Inadequate (1-2)	Average (3)	Good (4)	Excellent (5)
Evaluation Criteria	Evaluation Definition				
Modification	Student can Comprehensively modify a given model.				
Conventions Followed	Student can follow the conventions perfectly				
Result	Students can relate/ analyze his design with the conventions.				

XIV- Course Requirements

- Students are expected to attend at least 80% class.
- Students are expected to participate actively in the class.
- For both terms, there will be at least 2 quizzes based on the theoretical knowledge and conceptual understanding of the topic covered discussed in the classes.
- Submit report based on the given course related problems.
- Submission of assignment and projects should be in due time.

XV – Evaluation & Grading System*

The following grading system will be strictly followed in this class

MID TERM		FINAL TERM	
Attendance	10%	Attendance	10%
Quiz	10%	Quiz	40%
Midterm written exam	50%	Final term written exam	50%
Total	100%	Total	100%
Grand Total 100% = 40% of Midterm + 60% of Final Term			

Letter	Grade Point	Numerical %
A+	4.00	90-100
A	3.75	85 - < 90
B+	3.50	80 - < 85
B	3.25	75 - < 80
C+	3.00	70 - < 75
C	2.75	65 - < 70
D+	2.50	60 - < 65
D	2.25	50 - < 60
F	0.00	< 50
I		Incomplete
W		Withdrawal
UW		Unofficially Withdrawal

* The evaluation system will be strictly followed as par the AIUB grading policy.


XVI – Textbook/ References

1. Introduction to the Theory of Computation (Latest Edition)
by Michael Sipser
2. Introduction to Automata Theory, Languages, and Computation (Latest Edition)
by John E. Hopcroft, et al
3. Elements of the Theory of Computation (Latest Edition)
by Harry R. Lewis, Christos H. Papadimitriou

XVII - List of Faculties Teaching the Course

FACULTY NAME	SIGNATURE
Dr. Afroza Nahar	
K. M. Imtiaz-Ud-Din	
Md Masum Billah	
Sharfuddin Mahmood	

XVI – Verification

<p>Prepared by:</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;">  </div> <p>-----</p> <p><i>Sharfuddin Mahmood</i></p> <p>Date:..02/10/2023.....</p>	<p>Moderated by:</p> <p>-----</p> <p>Dr. Akinul Islam Jony <i>Point of Contact</i> <i>OBE Implementation Committee for CS</i></p> <p>Date:.....</p>	
<p>Checked by:</p> <p>.....</p> <p>Dr. Md. Abdullah-Al-Jubair <i>Director (Undergraduate Program),</i> <i>Department of Computer Science</i></p> <p>Date:.....</p>	<p>Certified by:</p> <p>.....</p> <p>Dr. Dip Nandi <i>Associate Dean,</i> <i>Faculty of Science & Technology</i></p> <p>Date:.....</p>	<p>Approved by:</p> <p>.....</p> <p>Mr. Mashiour Rahman <i>Dean in Charge,</i> <i>Faculty of Science & Technology</i></p> <p>Date:.....</p>