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| A picture containing diagram  Description automatically generated | **AMERICAN INTERNATIONAL UNIVERSITY-BANGLADESH (AIUB)**  Faculty of Science and Technology (FST)  Department of Computer Science (CS)  Undergraduate Program |



**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.

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| **COURSE PLAN** | **SEMESTER: Spring 2022-20223** |



## **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

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## **VIII - Course outcomes (CO) Matrix:**

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

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| **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-c-3 | |
| *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: \***

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| **Time Frame** | **CO**  **Mapped** | **Topics** | **Teaching**  **Activities** | **Assessment Strategy(s)** |
| Week 1 |  | 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 | CO1 | DFA, Non-determinism and Non-regular languages | Discussion, Group study and perform of exercises, PPT slides, board work | Group study, Homework, Quiz |
| Week 3 | CO1, CO2 | Closure, Regular Expression | Discussion, Group study and perform of exercises, PPT slides, board work | Pop Quiz, Class discussion, question answer session |
| Week 4 | CO1, CO2 | Regular Expression, Context free Languages | Discussion, Group study and perform of exercises | Pop Quiz, Class discussion, question answer session, Home work |
| Week 5 | CO3, CO4 | Context Free Grammar (CFG), Ambiguous Grammar,  Chomsky Normal Form | Discussion, Group study and perform of exercises, PPT slides, board work | Class discussion, question answer session |
| Week 6 | CO3, CO4 | Context Free Grammar (CFG), Ambiguous Grammar,  Chomsky Normal Form | Discussion, Group study and perform of exercises, PPT slides, board work | Quiz, Class discussion, question answer session |
| Week 7 |  | Viva, Review | Discussion, Group study and perform of exercises, PPT slides, board work |  |
| Midterm (Week 8) | | | | |
| Week 9 | CO3 | Push Down Automata | Discussion, Group study and perform of exercises, PPT slides, board work | 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 | CO3 | 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 | Quiz, Class discussion, question answer session |
| Week 13 |  | Turing Machine | 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 |
| Week 16 |  | Viva, Review | Discussion, Group study and perform of exercises, PPT slides, board work |  |
| Final term (Week 17) | | | | |

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

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## **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.

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## **XV – Evaluation & Grading System\***

The following grading system will be strictly followed in this class

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| **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** | | | |

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| **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.*

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## **XVI – Textbook/ References**

1. Introduction to the Theory of Computation (Latest Edition)

by Michael Sipser

1. Introduction to Automata Theory, Languages, and Computation (Latest Edition)

by John E. Hopcroft, et al

1. Elements of the Theory of Computation (Latest Edition)  
   by Harry R. Lewis, Christos H. Papadimitriou

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