AMERICAN INTERNATIONAL UNIVERSITY-BANGLADESH (AIUB)

Faculty of Science and Technology (FST)
Department of Computer Science (CS)
Undergraduate Program

COURSE PLAN

Summer 2021-2022 SEMESTER

I. Course Core and Title

CSC 1204: Discrete Mathematics

II. Credit

3 credit hours (3 hours of theory per week)

III. Nature

Core Course for CS, CSE, CSSE, SE, CIS

IV. Prerequisite

CSC 1102 (Programming Language 1)

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:

- Explain propositional logic and propositional equivalences
- Explain different types of sets and set operations
- Determine whether two compound propositions are logically equivalent using different techniques
- Describe different types of functions
- Discuss different representations of graphs
- Describe different types of tree traversal algorithms such as Preorder, Inorder, Postorder
- Explain Euler and Hamilton paths and circuits
- Discuss Relations and their properties

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	S	
CO1	Explain propositional logic and propositional equivalences.	2				1.1
CO2	Determine whether a function is one-to-one, onto, and/or one-to-one correspondence.		3			1.2
CO3	Determine whether a graph contains Euler or Hamilton circuit or path.		3			2.1
CO4	Analyze a Relation to verify whether it contains certain property.		4			2.2

C: Cognitive; P: Psychomotor; A: Affective; S: Soft-skills (CT: Critical Thinking, TS: Teamwork)
* CO assessment method and rubric of COs assessment is provided in Appendix section
** The numbers under the 'Level of Domain' columns represent the level of Bloom's Taxonomy each CO corresponds to.
*** The numbers under the 'PO Assessed' column represent the PO (appendix) each CO corresponds to.

IX – Topics to be covered in the class:

TOPICS	Specific Objective(s)	Time Frame	Suggested Activities	Teaching Strategy(s)	
Logic	Knowing Mission & Vision of AIUB. To present an overview of the course and discuss the course contents, Propositional Logic, Propositional Equivalences, Predicates and Quantifiers	Week 1 & 2	Justifying, Group study, solving exercises	Lecture, Student reporting and Board work	CO1
Sets Functions	Sets, Set Operations, bit string as a set operation, Functions, different types of functions – One-to-one, Onto, One-to-one correspondence, Inverse function, Composite function.	Week 3 & 4	Justifying, Group study, solving exercises	Quiz 1 Lecture, Student reporting and Board work	CO2
Integers and Matrices	The Integers and Division, Fundamental Theorem of Arithmetic, Division Algorithm, Primes and Greatest common divisors, Least common multiples, Primality, Relative Primality, Modular arithmetic, Congruence, Caesar's Cipher, Matrices, Matrix arithmetic and Boolean operations, Zero-one matrix	Week 5	Justifying, Group study, solving exercises	Quiz 2 Lecture, Student reporting and Board work	
Mathematical Induction	Methods of Proof, Proof by Mathematical Induction	Week 6	Justifying, Group study, solving exercises.	Lecture, Student reporting and Board work	
Midterm Exam	**Week 7**				
Counting Technique	The Basics of Counting, Sum Rule, Product Rule, The Pigeonhole Principle.	Week 8	Justifying, Group study, solving exercises	Lecture, Student reporting and Board work	

Relations	Relations and Their Properties, Representing Relations using matrix and directed graph	Week 8 & 9	Justifying, Group study, solving exercises	Quiz 1 Lecture, Student reporting and Board work	CO4
Graphs	Introduction to Graphs, Graph Terminology, Representing Graphs and Graph Isomorphism, Connectivity. Euler and Hamilton Paths & circuits, Planar Graphs, Graph Coloring.	Week 10, 11 & 12	Justifying, Group study, solving exercises	Lecture, Student reporting and Board work	CO3
Trees	Introduction to Trees, Applications of Trees, Binary Search Tree, Tree Traversal.	Week 13	Justifying, Group study, solving exercises	Quiz 2 Lecture, Student reporting and Board work	
Final Exam	**Week 14**				

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

XI- Course Requirements

At least 80% class attendance is mandatory to pass the course. All students are expected to attend all scheduled classes as well as counselling, and to read all assigned chapters/materials before coming to class. If there is any assignment given to the students, they have to submit it before the deadline decided by the course teacher.

XII – Evaluation & Grading System

The following grading system will be strictly followed in this class

Marking system for Theory Classes (Midterm and Final term)	
Quizzes	40%
Attendance	10%
Midterm/Final term exam	50%
Total	100%
Final Grade/ Grand Total	
Midterm:	40%
Final Term:	60%

Letter	Grade Point	Numerical %
A+	4.00	90-100
A	3.75	85-89
B+	3.50	80-84
B	3.25	75-79
C+	3.00	70-74
C	2.75	65-69
D+	2.50	60-64
D	2.25	50-59
F	0.00	<50(Failed)

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

XIII – Teaching Methods

Most of the topics will be covered from the textbook. For the rest of the topics, reference books will be followed. Class lectures will be uploaded on the web on a regular basis. White board will be used for most of the time. Multimedia projector will be used for the convenience of the students. Students must study up to the last lecture before coming to the class and it is suggested that they should go through the relevant topics before coming to the class. Just being present in the class is not enough- students must participate in classroom discussion and classwork actively.

XIV – Textbook/ References

Text Book:

1. *Discrete Mathematics and its applications with combinatorics and graph theory (7th edition)* by Kenneth H. Rosen [Indian Adaptation by KAMALA KRITHIVASAN], published by McGraw-Hill

Reference Books and Study Materials:

1. Discrete Mathematics, *Richard Johnsonbaugh*, Pearson education, Inc.
2. Discrete Mathematical Structures, *Bernard Kolman*, *Robert C. Busby*, *Sharon Ross,* Prentice-Hall, Inc.
3. Discrete and Combinatorial Mathematics, *R. P. Grimaldi,* 3rd Edition, Addison-Wesley
4. *SCHAUM'S outlines Discrete Mathematics(2nd edition)*, by *Seymour Lipschutz, Marc Lipson*
5. Discrete Mathematics Models, *F. S. Roberts*, Prentice Hall
6. Lecture notes

XV - List of Faculties Teaching the Course

A. G. M. ZAMAN
AFSAH SHARMIN
DR. MD ALAMGIR KABIR
DR. SHAKIR HOSSAIN
ISRAT JAHAN MOURI
MD. MAHMUDUR RAHMAN
MD. MANZURUL HASAN
MOHAMMAD SAMAWAT ULLAH
S.M. ABDUR ROUF BHUIYAN
VICTOR STANY ROZARIO

XVI – Verification:

Prepared by :	Moderated by :
Md. Manzurul Hasan 29.5.22 --------------------------------- **Md. Manzurul Hsasn** *Course Convener* Date:..	--------------------------------- *Point Of Contact* *OBE Implementation Committee for CS* Date:..

Checked by:	Certified by:	Approved by:
.... **Dr. Md. Abdullah - Jubair** *Head,* *Department of Computer Science* *(Undergraduate)* Date:..................................	.... **Dr. Dip Nandi** *Director,* *Faculty of Science & Technology* Date:..................................	.... **Mr. Mashiour Rahman** *Associate Dean,* *Faculty of Science & Technology* Date:..................................

APPENDIX

Program Outcomes (POs)

PO1	Engineering Knowledge
1.1	Apply the knowledge of mathematics, science, engineering fundamentals to the solution of complex engineering problems.
1.2	Apply the knowledge of an engineering specialization to the solution of complex engineering problems
PO2	Problem Analysis
2.1	Identify, Research and Formulate complex engineering problems
2.2	Analyze and Reach substantiated conclusions using the principle of mathematics, the natural sciences and the engineering sciences

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:

CO	Description	Learning Domain	Assessment Method	Assessment Rubric
CO1	Explain propositional logic and propositional equivalences.	Cognitive	Midterm Exam	Rubric for Midterm Exam
CO2	Determine whether a function is one-to-one, onto, and/or one-to-one correspondence.	Psychomotor	Midterm Exam	Rubric for Midterm Exam
CO3	Determine whether a graph contains Euler or Hamilton circuit or path.	Psychomotor	Final Term Exam	Rubric for Final Term Exam
CO4	Analyze a Relation to verify whether it contains certain property.	Psychomotor	Final Term Exam	Rubric for Final Term Exam

Rubric for Midterm Exam Assessment (CO1)

Marking Criteria	Marks Distribution (Maximum 5X4=20)				Acquired Marks
	Inadequate (0-2)	**Satisfactory (3)**	**Good (4)**	**Excellent (5)**	
Definition	• Student does not answer or vaguely define the terms or concept	• Definition provided with partial relevance to the subject matter.	• Correctly define the terms. May miss minor detail.	• Correctly and comprehensively define the term with examples.	
Usage of logic and/or laws of equivalences	• No usage of laws or incorrect usage of laws.	• Usage of laws without mentioning the name of laws.	• Usage of laws with mentioning the name of laws but with minor mistakes.	• Proper usage of laws mentioning their names correctly and without any mistake.	
Correctness of answer	• Arrived at incorrect answer.	• Arrived at correct answer but with some logical errors.	• Arrived at correct answer with minor errors.	• Arrived at correct answer with no error.	
				Acquired Marks:	
				CO Pass / Fail:	

Rubric for Midterm Exam Assessment (CO2)

Marking Criteria	Marks Distribution (Maximum 5X4=20)				Acquired Marks
	Inadequate (0-2)	**Satisfactory (3)**	**Good (4)**	**Excellent (5)**	
Definition	• Student does not define or vaguely define the terms or concept	• Definition provided with partial relevance to the subject matter.	• Correctly define the terms. May miss minor detail.	• Correctly and comprehensively define the terms.	
Reasoning	• Student does not provide reasoning or incorrect reasoning.	• Reasoning provided with partial relevance to the subject matter.	• Correct reasoning provided with minor mistakes.	• Correct reasoning provided with no mistake.	
Correctness of answer	• Arrived at incorrect answer.	• Arrived at correct answer but with some missing steps.	• Arrived at a correct answer with minor errors.	• Arrived at correct answer showing all the relevant steps and with no error.	
				Acquired Marks:	
				CO Pass / Fail:	

Rubric for Final term Exam Assessment (CO3)

Marking Criteria	Marks Distribution (Maximum 5X4=20)				Acquired Marks
	Inadequate (0-2)	**Satisfactory (3)**	**Good (4)**	**Excellent (5)**	
Definition	• Student does not define or vaguely define the terms or concept	• Definition provided with partial relevance to the subject matter.	• Correctly define the terms. May miss minor detail.	• Correctly and comprehensively define the terms.	
Correctness of the circuit or path	• Student does not write the circuit or path or write totally incorrect circuit or path	• Student identifies the circuit or path with major errors.	• Student identifies the correct circuit or path with minor errors.	• Student correctly identifies the circuit or path without any error.	
Correctness of answer	• Arrived at incorrect answer.	• Arrived at correct answer but with some missing steps.	• Arrived at a correct answer with minor errors.	• Arrived at correct answer showing all the relevant steps and with no error.	
Acquired Marks:					
CO Pass / Fail:					

Rubric for Final Term Exam Assessment (CO4)

Marking Criteria	Marks Distribution (Maximum 5X4=20)				Acquired Marks
	Inadequate (0-2)	Satisfactory (3)	Good (4)	Excellent (5)	
Definition	• Student does not define or vaguely define the term or concept	• Definition provided with partial relevance to the subject matter.	• Correctly define the term with no example. May miss minor detail.	• Correctly and comprehensively define the term with example.	
Reasoning	• Student does not provide reasoning or incorrect reasoning.	• Reasoning provided with partial relevance to the subject matter.	• Correct reasoning provided with minor mistakes.	• Correct reasoning provided with no mistake.	
Correctness of answer	• Arrived at incorrect answer.	• Arrived at correct answer but with some missing steps.	• Arrived at a correct answer with minor errors.	• Arrived at correct answer showing all the relevant steps and with no error.	
				Acquired Marks:	
				CO Pass / Fail:	