



Green University of Bangladesh (GUB)  
Dept. of Computer Science and Engineering



## COURSE OUTLINE

1	Faculty	Faculty of Science & Engineering			
2	Department	Department of CSE			
3	Program	B.Sc. in Computer Science and Engineering			
4	Name of Course	Discrete Mathematics			
5	Course Code	CSE 101			
6	Trimester and Year	Fall 2021			
7	Pre-requisites	None			
8	Status	Core Courses			
9	Credit	3.0			
10	Section	213DA, 213DB, 213DC, 213DD, 213DE, 213DF, PC-213DA, PC-213DB, 213EA+PC-213E			
11	Class Hours				
		Section	Class Day	Class Hours	Venue
		213DA	MONDAY+WEDNESDAY	11.30 AM-01.00 PM	Online
		213DB	TUESDAY+THURSDAY	11.30 AM-01.00 PM	Online
		213DC	TUESDAY+THURSDAY	11.30 AM-01.00 PM	Online
		213DD	TUESDAY+THURSDAY	10:00 AM - 11:30 AM	Online
		213DE	MONDAY+WEDNESDAY	01.30 PM-03.00 PM	Online
		213DF	TUESDAY+THURSDAY	8.30 AM-10.00 AM	Online
		PC-213 DA	MONDAY+WEDNESDAY	11.00 AM-12.30 PM	Online
		PC-213 DB	MONDAY+WEDNESDAY	01.00 PM-02.30 PM	Online
		PC-213DC	TUESDAY+THURSDAY	11.30 AM-01.00 PM	Online

		213EA+PC-213E	FRIDAY	10.30 AM-01:00 PM	Online																
12	Class Location	Online																			
13	Course website	<a href="https://classroom.google.com/u/0/c/NDAXNDg1MzA1MTUw">https://classroom.google.com/u/0/c/NDAXNDg1MzA1MTUw</a> (213DA) <a href="https://classroom.google.com/u/0/c/NDAXNDg1MzA1MTcw">https://classroom.google.com/u/0/c/NDAXNDg1MzA1MTcw</a> (213DB) <a href="https://classroom.google.com/u/0/c/NDAXNDg1MzA1MTUw">https://classroom.google.com/u/0/c/NDAXNDg1MzA1MTUw</a> (213DC) <a href="https://classroom.google.com/u/0/c/NDAXNDg1MzA1MTUw">https://classroom.google.com/u/0/c/NDAXNDg1MzA1MTUw</a> (213DD) <a href="https://classroom.google.com/u/2/c/NDAXNDg1MzA1MTUw">https://classroom.google.com/u/2/c/NDAXNDg1MzA1MTUw</a> (PC-213 DA) <a href="https://classroom.google.com/u/2/c/NDAXNDg1MzA1MTUw">https://classroom.google.com/u/2/c/NDAXNDg1MzA1MTUw</a> (PC-213 DB) <a href="https://classroom.google.com/c/NDAXNDg1MzA1MTUw">https://classroom.google.com/c/NDAXNDg1MzA1MTUw</a> (PC-213 DC) <a href="https://classroom.google.com/u/1/c/NDAXNDg1MzA1MTUw">https://classroom.google.com/u/1/c/NDAXNDg1MzA1MTUw</a> (213 DE) <a href="https://classroom.google.com/c/NDAXNDg1MzA1MTUw">https://classroom.google.com/c/NDAXNDg1MzA1MTUw</a> (213 DF) <a href="https://classroom.google.com/u/1/c/NDAXNDg1MzA1MTUw">https://classroom.google.com/u/1/c/NDAXNDg1MzA1MTUw</a> (213EA+PC-213E)																			
14	Instructor(s)	Prof. Dr. Abdur Razzaque (213EA+PC-213E) Ms. Sumaiya Kabir (213DA, 213DB) Ms. Shamima Akter (213 DC, 213 DD) Md. Sultanul Islam Ovi (PC-213 DA, PC-213 DB) Most. Rokeya Khatun (PC-213 DC) Ahmed Iqbal Pritom (213DE) Fatema Tuj Johora (213 DF)																			
15	Contact	<a href="mailto:razzaque@green.edu.bd">razzaque@green.edu.bd</a> (213EA+PC-213E), <a href="mailto:sumaiya@cse.green.edu.bd">sumaiya@cse.green.edu.bd</a> (213DA, 213DB), <a href="mailto:shamima_akter@cse.green.edu.bd">shamima_akter@cse.green.edu.bd</a> (213 DC, 213 DD) <a href="mailto:iqbal@cse.green.edu.bd">iqbal@cse.green.edu.bd</a> (213DE), <a href="mailto:fatema@cse.green.edu.bd">fatema@cse.green.edu.bd</a> (213 DF), <a href="mailto:sultanul@cse.green.edu.bd">sultanul@cse.green.edu.bd</a> (PC-213 DA, PC-213 DB) <a href="mailto:rokeya@cse.green.edu.bd">rokeya@cse.green.edu.bd</a> (213DC)																			
16	Office	NA (due to online classes)																			
17	Counseling Hours	<table><tr><th>Section</th><th>Day</th><th>Counseling Hours</th><th>Venue</th></tr><tr><td>213DA</td><td>Wednesday</td><td>01:00 PM-3:00 PM</td><td>Online</td></tr><tr><td>213DB</td><td>TUESDAY</td><td>01:00 PM-3:00 PM</td><td>Online</td></tr><tr><td>213 DC</td><td>Monday</td><td>01:00 PM-3:00 PM</td><td>Online</td></tr></table>				Section	Day	Counseling Hours	Venue	213DA	Wednesday	01:00 PM-3:00 PM	Online	213DB	TUESDAY	01:00 PM-3:00 PM	Online	213 DC	Monday	01:00 PM-3:00 PM	Online
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		213 DE	Tuesday	3.00 PM - 6.00 PM	Online
		213 DF	Monday	10.00 AM-1.00 PM	Online
		PC-213 DA	Wednesday	04.00 PM- 06.00 OM	Online
		PC-213 DB	Wednesday	04.00 PM- 06.00 OM	Online
		PC-213DC	Wednesday	04.00 PM- 06.00 OM	Online
		213EA+PC -213E	Friday	09.00 AM-10.30 AM	Online
18	<b>Text Book</b>	1. Rosen K.H (2007). Discrete Mathematics and it's applications. AMC, 7th edition.			
19	<b>Reference</b>	1. Goodaire, E.G., & Paramenter, M.M (1997). Discrete Mathematics with graph theory. Prentice hall PTR. 2. Biswal, P.C (2015). Discrete Mathematics and graph theory. PHI Learning Pvt. Ltd.			
20	<b>Equipment &amp; Aids</b>	Bring your own materials ( <i>calculator; pen, paper, etc.</i> ) to participate effectively in classroom activities. <b>You are not allowed to borrow from others inside the classroom during class activities.</b> <i>Note: Besides class note, Please keep at least one blank A4 size paper per class with you.</i>			
21	<b>Course Rationale</b>	Discrete Mathematics is needed to see mathematical structures in the object you work with, and understand their properties. This ability is important for software engineers, data scientists, security and financial analysts (it is not a coincidence that math puzzles are often used for interviews). We cover the basic notions and results (graphs, probability, number theory etc) that are universally needed. To deliver techniques and ideas in discrete mathematics to the learner we extensively use interactive puzzles specially created for this specialization. To bring the learners experience closer to IT-applications we incorporate programming examples, problems and projects in our courses.			
22	<b>Course Description</b>	Mathematical logic: propositional logic, predicate logic, mathematical reasoning and proof techniques; set theory: sets, relations, partial ordered sets, functions; counting: permutations, combinations, principles of inclusion and exclusion; discrete probability; functions: recurrence relations and recursive algorithms; growth of functions; graph theory: graphs, paths, trees; algebraic structures: rings and groups.			
23	<b>Course Outcomes (CO)</b>	After completing this course students will be able to-  CO1: Describe the basic characteristics and operations of logic, sets, functions relations, graphs and trees. [Cognitive]			

		CO2: Solve problems related to counting discrete objects and proving mathematical properties of a variety of discrete structures using principles of induction. [Cognitive]  CO3: Model and solve real world computing problems using various concepts of discrete mathematics. [Cognitive]
24	<b>Teaching Methods</b>	Most of the topics will be covered from PPT file which directly match to the textbook. For the rest of the topics, reference books will be followed. Class notes (Lecture PPT) will be uploaded on the web. White board will be used for most of the time. All the class will be conducted with projector. Students must participate in classroom discussions for case studies, problems solving.
25	<b>Topic Outline</b>	All topics and problems are from the main text if not specified otherwise.

Lecture	Selected Topics	PPT	Text Book	Suggested Problems. (Text)	Outcome
(1)	Socialization and Introduction to the course	-			
(2-3)	Logic	PPT-1		Page-12 Problem (1-20) Page-22 Problem (1-20)	CO1
	Propositional Logic	PPT-1	1.1		
	Composite Statements	PPT-1	Page -6		
	Logical Connectives	PPT-1	Page-(4-9)		
	Application of Propositional Logic	PPT-1	1.2		
(4-5)	Logic	PPT-2		Page-78 Problem (1-9)	CO1
	Limitation of Propositional Logic	PPT-2			
	Predicate Logic	PPT-2	1.4		
	Quantifier	PPT-2	1.4		
	Rule of Inference	PPT-2	1.6		
(6-8)	Set	PPT-3		Page-125 Problem (1-44)  Page-136 Problem (1-29)	CO1
	Basic Discrete Structure	PPT-3	2.1		
	Set	PPT-3	2.1		
	Cardinality	PPT-3	Page-121,170		
	Infinite Set	PPT-3	Page-121		
	Power Set	PPT-3	Page-121		
	Cartesian Product	PPT-3	Page-122		
	Set Operation	PPT-3	2.2		
	Computer Representation of Set	PPT-3	Page-134		

(9-11)	<b>Function</b>			Page-152 Problem (1-6)	CO1	
	Function	PPT-4	2.3			
	Representing a Function	PPT-4				
	Notation of Set	PPT-4				
	Injective Function	PPT-4				
	Surjective Function	PPT-4				
	Bijection Function	PPT-4				
	Inverse Function	PPT-4	Page-145			
	Composition of Function	PPT-4	Page-145			
(12)	<b>Mathematical Induction</b>			Page-329 Problem (1-2) Page-451  Problem (1-24)	CO2	
	Proof Technique	PPT-5	5.1			
	Mathematical Induction	PPT-5	5.1			
	(13)	<b>Discrete Probability</b>				Chapter-7
		Discrete Probability	PPT-6			7.1
		Uniform Probability Measure	PPT-6			Page-121
		Probability of Complementary Event	PPT-6			Page-455
		Probability of a Union Event	PPT-6			Page-455
(14-16)	Graph	-				
	Graph	PPT-6		Page-649 Problem (1-10)  Page-665 Problem (1-58)  Page-675 Problem (1-18)	CO1, CO3	
	Terminology	PPT-6	10.1			
	Directed Graph	PPT-6	10.2			
	Undirected Graph	PPT-6	Page-654			
	Complete Graph	PPT-6	Page-652			
	Bipartite Graph	PPT-6	Page-684			
	Subgraph	PPT-6	Page-656			
	Representation of Graph	PPT-6	Page-663			
(17-18)	Tree			Page-755 Problem (1-33)	CO1, CO3	
	Tree	PPT-7				
	Rooted Tree	PPT-7	11.1			
	M-ary Tree	PPT-7	Page-747			
	Binary Tree	PPT-7	Page-773			
	Complete Binary Tree	PPT-7	Page-748			
(19-20)	Counting			Page-413 Problem (1-38)	CO2	
	Counting	PPT-8	6.1			
	Counting Rules	PPT-8	Page-386			
	Inclusion	PPT-8				
	Pigeonhole principle	PPT-8	6.2			
	Permutation	PPT-8	6.3			

		Combination	PPT-8	6.3 Page (409)																													
		Caesar Cipher	PPT-8	6.1																													
	(21-22)	Basic Number Theory			Problem (1-8)  Page-284 Problem (1-10)	CO1, CO3																											
		Importance of Number Theory	PPT-9																														
		Divisors	PPT-9	4.1																													
		Prime Numbers	PPT-9	4.3																													
		Fundamental Theorem of Arithmetic	PPT-9	Page-258																													
		GCD and Relatively Prime	PPT-9	Page-256																													
		Least Common Multiple	PPT-9	Page-256																													
		Mod Function	PPT-9	Page-253																													
	(23-24)	Relation	PPT-10		Page-579 Problem (1-16)	CO1																											
		Binary Relation	PPT-10	9.1																													
		Reflexive Relation	PPT-10	Page-576																													
		Symmetric Relation	PPT-10	Page-579																													
		Transitive Relation	PPT-10	Page-579																													
		Closure of a Relation	PPT-10																														
		Composite Relation	PPT-10	9.1																													
		Equivalence Relation	PPT-10																														
	26	Assessment and Marks Distribution:	Students will be assessed on the basis of their overall performance in all the exams, quizzes, and class participation. Final numeric reward will be the compilation of (tentative): <ul style="list-style-type: none"><li>• Class Test (15%)</li><li>• Group Assignment (5%)</li><li>• Individual Presentation (5%)</li><li>• Class Attendance (5%)</li><li>• Mid-Term (30%)</li><li>• Final Exam (40%)</li></ul>																														
27	Assessment Methods of COs	Assessment methods of COs are given below: <table><tr><td></td><td colspan="3">Course Outcomes</td></tr><tr><td>Assessment Methods</td><td>CO1</td><td>CO2</td><td>CO3</td></tr><tr><td>Class Test</td><td>15%</td><td></td><td></td></tr><tr><td>Group Assignment, Individual Presentation, Attendance</td><td></td><td>5%</td><td>10%</td></tr><tr><td>Mid-Term Exam</td><td>10%</td><td>20%</td><td></td></tr><tr><td>Final Exam</td><td>15%</td><td>25%</td><td></td></tr><tr><td>Total (100%)</td><td>40%</td><td>50%</td><td>10%</td></tr></table>					Course Outcomes			Assessment Methods	CO1	CO2	CO3	Class Test	15%			Group Assignment, Individual Presentation, Attendance		5%	10%	Mid-Term Exam	10%	20%		Final Exam	15%	25%		Total (100%)	40%	50%	10%
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28	Mapping of COs with PLOs	<table><tr><td colspan="11">Mapping of COs with program outcomes (POs) are given below:</td></tr><tr><td colspan="11">Program Outcomes (PLOs)</td></tr><tr><td>COs</td><td>PO1</td><td>PO2</td><td>PO3</td><td>PO4</td><td>PO5</td><td>PO6</td><td>PO7</td><td>PO8</td><td>PO9</td><td>PO10</td></tr><tr><td>CO1</td><td>√</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>CO2</td><td></td><td>√</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>CO3</td><td></td><td></td><td>√</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>	Mapping of COs with program outcomes (POs) are given below:											Program Outcomes (PLOs)											COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	CO1	√										CO2		√									CO3			√							
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30	Additional Course Policies	<table><tr><td>Assignments and Capstone Project Presentation</td><td>There will be one assignment and a capstone project presentation. Average marks will be counted. Delayed submission will not be accepted. <b>Any kind of plagiarism in assignment will carry zero mark.</b> Two or more copied assignments will carry zero mark in all assignments. <b>Zero tolerance will be shown in this regard.</b> Capstone Project Presentation will be on group basis. Three groups will present their task at the end of class. <b>Project idea, dress code, &amp; presentation fluency will differentiate the team members marks.</b></td></tr><tr><td>Class Test (CT)</td><td>There will be three CTs, best of two will be counted. A CT can be taken with an announcement in prior or without any announcement.</td></tr><tr><td>Exams</td><td>Mid-term and final exam will be closed book, closed notes. Mobile is strictly prohibited in exam hall. Please bring your own watch and synchronize time during exam hours.</td></tr><tr><td>Test Policy:</td><td>If any student fails to appear in the test and have not clarified the actual reason to the teacher personally beforehand, his/her score for the test will be zero. No make-up for class test will be taken because it has alternative (three out of four). No make-up for mid will be entertained without presence and recommendation of guardian and written permission of the department.</td></tr></table>	Assignments and Capstone Project Presentation	There will be one assignment and a capstone project presentation. Average marks will be counted. Delayed submission will not be accepted. <b>Any kind of plagiarism in assignment will carry zero mark.</b> Two or more copied assignments will carry zero mark in all assignments. <b>Zero tolerance will be shown in this regard.</b> Capstone Project Presentation will be on group basis. Three groups will present their task at the end of class. <b>Project idea, dress code, &amp; presentation fluency will differentiate the team members marks.</b>	Class Test (CT)	There will be three CTs, best of two will be counted. A CT can be taken with an announcement in prior or without any announcement.	Exams	Mid-term and final exam will be closed book, closed notes. Mobile is strictly prohibited in exam hall. Please bring your own watch and synchronize time during exam hours.	Test Policy:	If any student fails to appear in the test and have not clarified the actual reason to the teacher personally beforehand, his/her score for the test will be zero. No make-up for class test will be taken because it has alternative (three out of four). No make-up for mid will be entertained without presence and recommendation of guardian and written permission of the department.																																																										
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31	Additional Information	<p>a. Academic Calendar Fall 2021: <a href="http://www.green.edu.bd/academics/academic-calendar">http://www.green.edu.bd/academics/academic-calendar</a>.</p> <p>b. Academic Information and Policies: <a href="http://www.green.edu.bd/academics/academic-rules-a-regulations">http://www.green.edu.bd/academics/academic-rules-a-regulations</a>.</p> <p>c. Grading and Performance Evaluation:</p> <p>d. <a href="http://www.green.edu.bd/academics/academic-rules-a-regulations">http://www.green.edu.bd/academics/academic-rules-a-regulations</a>.</p> <p>Proctorial Rules: <a href="http://www.green.edu.bd/administrator/proctors-office">http://www.green.edu.bd/administrator/proctors-office</a>.</p>																																																																		

