COMSATS University Islamabad
Department of Computer Science
Course Syllabus

Course Information

Course Code: **CSC102** | Course Title: **Discrete Structures**
Credit Hours: **3(3,0)** | Lecture Hours/Week: **3**
Lab Hours/Week: **0** | Pre-Requisites: **None**

Catalogue Description:

This course introduces mathematical structures necessary for the development of program logic. It covers the following topics: Set Theory; Propositional & First Order Logic; Rules of Inference; Mathematical Proofs; Counting & Probability; Graphs & Tree Structures; and Discrete Probability.

Text and Reference Books

Textbook:

1. Discrete Mathematics and Its Applications, Rosen, K. H., McGraw Hill, 2018.

Reference Books:

1. Discrete Mathematics with Applications, Susanna S.E., Cengage Learning, 2019.
2. Discrete Mathematics, John, D., Pearson, 2017.

Week wise Plan:

Lecture #	CDF Unit #	Topics Covered	Reading Material
1.	1	Overview of Discrete Structures, and Related Applications.	Ref. Material
2.	1	Logic Definition, Proposition (logic & variables), Disjunction, Conjunction, Negations, Conditional Statements, and Bi-Conditional Statements.	Rosen: Ch1
3.	1	Truth Tables for Compound Proposition, Bit Operations, Translating English Sentences into Compound Propositions, and Logical Equivalences.	Rosen: Ch1
4.	1	Tautologies & Contradiction, De Morgan's Law, and Useful Logical Equivalences.	Rosen: Ch1
5.	1	Notions of Implication (Converse, Inverse, Contrapositive).	Rosen: Ch1
6.	1	Predicate Logic: Valid & Invalid Arguments.	Rosen: Ch1
7.	1	Use of Universal & Existential Quantifiers with Examples.	Rosen: Ch1
8.	2	Inference Rules (Modus Tollens & Modus Ponens).	Rosen: Ch1, Ref. Material
9.	2	Inference Rules: Propositional and Building Arguments.	Rosen: Ch1, Ref. Material
10.	3	Concepts of Sets: Representation of a Set (Descriptive, Tabular & Set builder Notation), Set Equality Cardinality, Subset, Power Set, Operations on Sets, Venn Diagram, and Truth Table Representation of Set Operation.	Rosen: Ch2
11.	3	Relations: Relations on a Set, and Properties of a Relation (Reflexive, Symmetric, Anti-Symmetric & Transitive Relation).	Rosen: Ch9
12.	3	Combining Relations, Composition of Relations, and Matrix Representation of Relations.	Rosen: Ch9
13.	3	Representing Relations using Digraphs, and Equivalence Relation.	Rosen: Ch9

14.	3	Functions, Domain, Co-Domain, Range, One-to-One Functions, and Onto Function.	Rosen: Ch2
15.	3	Identity Function, Inverse Function, and Composition of Function.	Rosen: Ch2
16.	3	Sequence: Geometric Progressions, and Arithmetic Sequence.	Rosen: Ch2, Ref. Material
17.	**Mid Term Exam**		
18.			
19.	3	Fibonacci Series, Sequences Defined by Recurrence Relations, and Solving Recurrence Relations.	Rosen: Ch2, Ref. Material
20.	4	Proofs: Structure, Direct Proofs, Proof by Counter Example, and Proof by Contradiction.	Rosen: Ch1
21.	4	Mathematical & Structural Induction.	Rosen: Ch5
22.	4	Weak & Strong Induction, Recursive Mathematical Definitions, and Well Ordering.	Rosen: Ch5
23.	5	Counting Arguments, Sum & Product Rule, and Inclusion-Exclusion Principle.	Rosen: Ch6
24.	5	Permutations & Combinations.	Rosen: Ch6
25.	5	Pascal's Identity, and Binomial Theorem.	Rosen: Ch6
26.	5	Finite Probability Space, Axioms of Probability, Probability Measure, and Events.	Rosen: Ch7
27.	5	Conditional Probability, Independence, and Expectation.	Rosen: Ch7
28.	6	Graphs: Models, Terminology, Representation, and Isomorphism.	Rosen: Ch10
29.	6	Euler & Hamilton Paths, and Complete Graphs.	Rosen: Ch10
30.	6	Graph Coloring, and Bipartite Graph.	Rosen: Ch10
31.	6	Trees, and Applications.	Rosen: Ch11
32.	6	Traversal Strategies, Infix, Prefix, and Postfix Notations.	Rosen: Ch11
Final Term Exam			

Student Outcomes (SOs)

S.#	Description
1	Apply knowledge of computing fundamentals, knowledge of a computing specialization, and mathematics, science, and domain knowledge appropriate for the computing specialization to the abstraction and conceptualization of computing models from defined problems and requirements
2	Identify, formulate, research literature, and solve *complex* computing problems reaching substantiated conclusions using fundamental principles of mathematics, computing sciences, and relevant domain disciplines
3	Design and evaluate solutions for *complex* computing problems, and design and evaluate systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations

Course Learning Outcomes (CLOs)

Sr.#	Unit #	Course Learning Outcomes	Blooms Taxonomy Learning Level	SO
CLO-1	1	Model real life problems using symbolic logic.	*Applying*	1,2
CLO-2	2	Apply rules of inference to build logical arguments.	*Applying*	1,2
CLO-3	3	Perform the operations associated with sets, functions, and relations.	*Applying*	1
CLO-4	4	Apply appropriate proof techniques to construct a sound argument.	*Applying*	2
CLO-5	5	Use probabilistic concepts to solve a particular problem.	*Applying*	1,2

CLO-6	6	Model a real-world problem using graphs and trees.	*Applying*	1-3

CLO Assessment Mechanism

Assessment Tools	CLO-1	CLO-2	CLO-3	CLO-4	CLO-5	CLO-6
Quizzes	Quiz 1	Quiz 2	Quiz 3	Quiz 3	Quiz 4	-
Assignments	Assignment 1	Assignment 1	Assignment 2	Assignment 3	Assignment 4	Assignment 4
Midterm Exam	Mid Term Exam			-	-	-
Final Term Exam	Final Term Exam					

Policy & Procedures

- **Attendance Policy:** Every student must attend 80% of the lectures as well as laboratory in this course. The students falling short of required percentage of attendance of lectures/laboratory work, is not allowed to appear in the terminal examination.

- **Course Assessment:**

	Quizzes	Assignments	Mid Term Exam	Terminal Exam	Final Marks
Theory (T)	15	10	25	50	100

- **Grading Policy:** The minimum passing marks for each course is 50% (In case of LAB; in addition to theory, student is also required to obtain 50% marks in the lab to pass the course). The correspondence between letter grades, credit points, and percentage marks at CUI is as follows:

Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	F
Marks	>= 85	80 - 84	75 - 79	71 - 74	68 - 70	64 - 67	61 - 63	58 - 60	54 - 57	50-53	< 50
Cr. Point	3.67-4.00	3.34-3.66	3.01-3.33	2.67-3.00	2.34-2.66	2.01-2.33	1.67-2.00	1.31-1.66	1.01-1.30	0.10-1.00	0.00

- **Missing Exam:** No makeup exam will be given for final exam under any circumstance. When a student misses the mid-term exam for a legitimate reason (such as medical emergencies), his grade for this exam will be determined based on the Department policy. Further, the student must provide an official excuse within one week of the missed exam.

- **Academic Integrity:** All CUI policies regarding ethics apply to this course. The students are advised to discuss their grievances/problems with their counsellors or course instructor in a respectful manner.

- **Plagiarism Policy:** Plagiarism, copying and any other dishonest behaviour is prohibited by the rules and regulations of CUI. Violators will face serious consequences.