



**COMSATS University Islamabad**  
**Department of Computer Science**  
**Course Description Form (CDF)**

**Course Information**

Course Code: **CSC102**

Credit Hours: **3(3,0)**

Lab Hours/Week: **0**

Course Title: **Discrete Structures**

Lecture Hours/Week: **3**

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.

**Unit wise Major Topics:**

Unit	Topic	No of teaching hours
1.	Propositional Logic: Logical Connectives, Truth Tables, Normal Forms, Negation, Notions of Implication, Converse, Inverse, Contrapositive, Tautology & Contradiction, Valid & Invalid Arguments, Predicate Logic, Translation of English Sentences into Logical Expressions, Applications, and Limitations.	10.5
2.	Rules of Inference: Propositional and Building Arguments.	3
3.	Sets & Relations: Venn Diagram, Union, Intersection, Complement, Cartesian Product, Product Sets, Cardinality of Finite Sets; Relations: Reflexivity, Symmetry, Transitivity, Equivalence Relations, Partial Orders; Functions: Surjections, Injections, Bijection, Inverses, Composition; Sequence: Arithmetic & Geometric Progressions, Fibonacci Series, and Solving Recursive Relations.	12
4.	Proofs: Structure, Direct Proofs, Proof by Counter Example, Proof by Contradiction, Mathematical & Structural Induction, Weak & Strong Induction, Recursive Mathematical Definitions, and Well Ordering.	4.5
5.	Counting & Probability: Counting Arguments, Sum & Product Rule, Inclusion-Exclusion Principle, Pigeonhole Principle, Permutations & Combinations, Pascal's Identity, Binomial Theorem, Finite Probability Space, Axioms of Probability, Probability Measure, Events, Conditional Probability, Independence, and Expectation.	7.5
6.	Graphs: Models, Terminology, Representation, Isomorphism, Euler & Hamilton Paths, Complete Graphs, Bipartite Graphs,	7.5

	Graph Coloring, Trees, Traversal Strategies, and Applications.	
<b>Total Contact Hours</b>		<b>45</b>

#### Mapping of CLOs and SOs

Sr.#	Unit #	Course Learning Outcomes	Blooms Taxonomy Learning Level	SO
CLO-1	1	Model real life problems using symbolic logic.	<i>Applying</i>	1,2
CLO-2	2	Apply rules of inference to build logical arguments.	<i>Applying</i>	1,2
CLO-3	3	Perform the operations associated with sets, functions, and relations.	<i>Applying</i>	1
CLO-4	4	Apply appropriate proof techniques to construct a sound argument.	<i>Applying</i>	2
CLO-5	5	Use probabilistic concepts to solve a particular problem.	<i>Applying</i>	1,2
CLO-6	6	Model a real world problem using graphs and trees.	<i>Applying</i>	1,2,3

#### 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	Mid Term Exam	Mid Term Exam	-	-	-
Final Term Exam	Final Term Exam					

#### Text and Reference Books

##### Text Book:

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.