# Discrete Structures

## Fall 2021

**Instructor:** Nouman Azam

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**Lectures:**
Check Time Table regularly

**Office Hours:**
Tuesdays 11:00 am – 2:00 pm.

**Contact:**

By appointment (email me).

**Texts**

**1. Discrete Mathematics and its Applications** by Kenneth H. Rosen. (7th Edition)

**2.** Discrete Mathematics and its Applications by Susanna S. Epp

**Course Objectives**

To develop mathematical maturity for Students entering the Computer Science program and cover specific topics relevant to further study in Computer Science. The course will aim to make students understand the basic set terminology and operations, characterization of mathematical relationships, basic terminology and operations for trees and graphs. By course completion students will have a good understanding of the discrete structures.

**Course Outlines and Contents**

The course will covers topics in preposition logic and predicate logic alongwith its application and usage, mathematical proofs, binary relations, representation of relations, properties in relations, equivalence relations and partial orderings, graphs, bipartite graphs, graph coloring, cut vertex and cut edge, Hamilton and euler circuits, shortest path, trees, tree traversal and minimum spanning trees.

| Date | Duration | Topics Covered |
|---|---|---|
| Week 1 | 1.5 | Propositional Logic, Truth tables of compound propositions, Precedence of logical operators |
| | 1.5 | Propositional Equivalences, Constructing new logical equivalences, Translating English sentences, Examples of propositional logic |
| Week 2 | 1.5 | Predicates , Quantifiers, nested quantifiers, precedence of quantifiers, logical equivalences involving quantifiers, Using quantifiers in systems specification, logic programming using prolog |
| | 1.5 | Nested Quantifiers, translating mathematical statements using nested quantifiers, English statements using nested quantifiers |
| Week 3 | 1.5 | Prolog programming and Proofs<br>Relations and their properties, combining relations, n-ary relations, databases and relations |
| | 1.5 | Symmetric, reflexive, antisymetric and transitive properties. |
| Week 4 | 1.5 | Representing relations using matrices, |
| | 1.5 | Representing relations using graphs |
| Week 5 | 1.5 | Closures of relations, reflexive, symmetric and transitive closures. |
| | 1.5 | Equivalence relations and equivalence classes |
| Week 6 | 1.5 | Sessional I |
| | 1.5 | Partitions, Partial ordering |
| Week 7 | 1.5 | Lexicographic ordering |
| | 1.5 | Hasse Diagram, Maximal and minimum elements, Least upper bound and greatest lower bounds |
| Week 8 | 1.5 | Lattices |
| | 1.5 | Common types of graphs, Properties of graphs |
| Week 9 | 1.5 | Bipartitite graphs and its properties |
| | 1.5 | Representing graphs, |

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| Week 10 | 1.5 | Graphs isomorphism and its checks |
| | 1.5 | Connectivity in graphs, connected components and disconnected components |
| Week 11 | 1.5 | Sessional II |
| | 1.5 | Paths and isomorphism |
| Week 12 | 1.5 | Euler paths and circuits |
| | 1.5 | Hamilton paths and circuits |
| Week 13 | 1.5 | Shortest path problem, Dijkestra algorithm |
| | 1.5 | Traveling saleman problem |
| Week 15 | 1.5 | Graph coloring and its applications |
| | 1.5 | Trees basic definition and properties and application |
| Week 16 | 1.5 | Preorder, inorder and post order traversal |
| | 1.5 | Spanning trees, minimum spanning trees, backtracking |