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| Logo Fast | **NATIONAL UNIVERSITY**  **of Computer & Emerging Sciences, Lahore** |

Department of Computer Science

**CS 1005– Discrete Structures**

**FALL 2023**

**Program:** BSCS / BDS **Credit Hours:** 3 **Type:** Core

**Course Moderator:** Dr. Saeeda Zia

**Course Description/Objectives/Goals:**

The goal of this course is to introduce the students to “Discrete Mathematics”, which is an important area of mathematics and theoretical computer science. It deals with structures that are not continuous and do not vary smoothly, but are distinct with separate values. The course covers the basics of logic, set theory, proof techniques, counting, number theory and graph theory.

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| **Course Learning Outcomes (CLOs):** | | |
| At the end of the course students will be able to: | **Domain** | **BT\* Level** |
| 1. Understand the key concepts of Discrete Structures such as Sets, Permutations, Combinations , Relations, Graphs, etc. | C | 2 |
| 2. Apply formal logic proofs and/or informal, but rigorous, logical reasoning. | C | 3 |
| 3. Apply discrete structures into computing problems. | C | 3 |
| 4. Differentiate various discrete structures. | C | 4 |
| \* BT= Bloom’s Taxonomy, C=Cognitive domain, P=Psychomotor domain, A= Affective domain.  **Bloom's taxonomy Levels:**1. Knowledge, 2. Comprehension, 3. Application, 4. Analysis, 5. Synthesis, 6. Evaluation | | |

**Course Textbook**

1. Kenneth H. Rosen, Discrete Mathematics and Its Applications, seventh Edition., McGraw-Hill.

**Additional references and books related to the course:**

1. Ralph P. Grimaldi, *Discrete and Combinatorial Mathematics: An Applied Introduction*, Fourth edition or later, Addison-Wesley.

2. Winifred K. Grassman, Jean P. Tremblay, *Logic and Discrete Mathematics: A Computer Science Perspective,* International Edition (or edition 1 or later), Prentice Hall.

3. Stuart Russell and Peter Norvig, *Artificial Intelligence, A Modern Approach*, Second edition or later, Pearson.

**Tentative Weekly Schedule**

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| Week | Topics to be covered | Readings | Assignments/Projects? |
| 1 | Introduction to discrete structures |  |  |
| 2 | Propositional calculus, logical connectives and examples |  |  |
| 3 | Propositional calculus continued, inference techniques |  |  |
| 4 | First order logic: predicates and quantifiers, inference techniques |  |  |
| 5 | Set theory: set operations, set relationships, Functions, classification and composition. |  |  |
| 6 | Midterm Exam 1 |  |  |
| 6 | Cardinality of sets. countable and uncountable sets |  |  |
| 7 | Binary and n-ary Relations, representing Relations, closure, equivalence |  |  |
| 8 | Proof techniques |  |  |
| 9 | Proof techniques continued + Mathematical induction with examples |  |  |
| 10 | Number theory: Euclidean algorithm, LCM, Fermat’s little theorem, Chinese remainder theorem, modular exponentiation. |  |  |
| 11 | Recurrence relation, homogenous and non-homogenous equations |  |  |
| 12 | Midterm 2 |  |  |
| 12 | Introduction to counting, permutations, combinations, pigeon hole principle |  |  |
| 13 | Combinatorics: Pascal’s Triangle, pascal’s identity, Vandermonde identity |  |  |
| 14 | Introduction to graphs |  |  |
| 15 | Problems related to graphs |  |  |

**Evaluations**

1. Assignments: 10%
2. Quizzes: 10%
3. Midterm Exams:30%
4. Final Exam: 50%

**Course Policies**

1. No makeup for missed quizzes or assignments.
2. 80% attendance is essential

**Grading Scheme**

Absolute