RIPHAH INTERNATIONAL COLLEGE
ADP Computing/Computer Systems/Computer Graphics

Course Title:	**Introduction to Discrete Structures**	**Semester:**	**I/II**
Course code:		**Credit Hours:**	**3**
Prerequisites		**Lecture type**	**Class room Lectures/Lab Sessions/Project Presentation**

Instructor Name:	**Email:**
Consulting Hours:	**Contact info**

I. Course Description:

Discrete mathematics is a bridge connecting mathematics with various branches of Computer Science. It lays the foundation for different areas of study like Digital Design, Computer Programming, Computer Networks, Algorithm Analysis, Artificial Intelligence, etc.

II. Course Objectives:

- Examine the logical validity of arguments and proofs as they apply to Boolean expressions.
- Apply mathematical induction and other techniques to prove mathematical results
- Solve problems involving sets, relations, functions, and congruences.
- Perform computations using recursively defined functions and structures.
- Use methods of combinatorics to solve counting problems.
- Illustrate the basic terminology and properties of graphs and trees.
- Use graphs and trees to solve problems algorithmically.

III. Course Learning Outcomes:

- Students will be able to analyze and assess the logical validity of arguments and proofs related to Boolean expressions.
- Students will apply mathematical induction and other formal proof techniques to demonstrate the validity of mathematical results.
- Students will solve problems involving sets, relations, functions, and congruences using appropriate mathematical strategies.
- Students will perform computations using recursively defined functions and structures, demonstrating an understanding of their applications.
- Students will apply combinatoric methods to solve complex counting problems.
- Students will describe and illustrate basic terminology, properties, and structures of graphs and trees.
- Students will use graphs and trees to model and solve algorithmic problems effectively.

IV. Course Grading Policy:

- The instructor is responsible for grading all student performance through examinations, class participation in discussions, individual and/or team presentations, short or major papers requiring research or analysis, and other appropriate means. Individual discussions of the reading material may be held at the instructor's discretion. If any projects or assignments are identical or partially identical, a zero will be awarded. The repetition of such instances may result in an "F" grade in the course.

- **Grade Distribution:**

Evaluation Type	Percentage (%)	Activities
Quizzes	10	Minimum 4
Assignments	10	Minimum 4
Presentation	10	Minimum 1
Mid Term	30	
Final Term	40	
Total Points	**100**	

ABSOLUTE GRADING

V. General Classroom Norms (Attendance required: Minimum 75%)

Class attendance is mandatory. You may miss up to **25%** (8 out of 32 sessions) class sessions but save it for emergency only. In case you exceed this level, you will be withdrawn from the course. As a courtesy to the instructor and other students, be prepared to arrive at class and be in your seat on time. In addition, please note that each class lasts for **90 minutes** (1.5 Hours).

Also keep in mind some general rules in the class as given below:

- Cell phones should be powered off.
- Eatables are not allowed in the class.
- The teacher will not tolerate any disruptive behavior in the class.

The University Dress Code has to be observed, no warnings will be given, and violators will be asked politely to leave the class and consequently will be marked absent.

VI. Course Content & Schedule:

Week	Lecture No.	Lecture Contents	Lecture Material	Activity
Week 1	Lecture 1	• Propositional Logic: • Propositions • Truth values	• Discrete Mathematics with Applications, Susanna S. Epp, 5th edition • Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th edition	
	Lecture 2	• Logical Connectives and their truth tables • Negation, • Conjunction, • Disjunction,	• Discrete Mathematics with Applications, Susanna S. Epp, 5th edition • Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th edition	
Week 2	Lecture 3	• De Morgan's Laws, • Implication, • Equivalence. • Conditional statement, • Valid and Invalid Arguments	• Discrete Mathematics with Applications, Susanna S. Epp, 5th edition • Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th edition	**Assignment 1**
	Lecture 4	• Logical Quantifiers and their negation. • Priority and Precedence. •	• Discrete Mathematics with Applications, Susanna S. Epp, 5th edition • Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th edition	
Week 3	Lecture 5	• Tautologies, • Contradictions	• Discrete Mathematics with Applications, Susanna S. Epp, 5th edition • Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th edition	
	Lecture 6	• Introduction to Predicates and Quantified Statements,	• Discrete Mathematics with Applications, Susanna S. Epp, 5th edition • Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th edition	
Week 4	Lecture 7	• The Existential Quantifier, Universal Quantifier	• Discrete Mathematics with Applications, Susanna S. Epp, 5th edition • Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th edition	**Quiz 1**
	Lecture 8	• Proving and disproving universal and existential statements	• Discrete Mathematics with Applications, Susanna S. Epp, 5th edition	

			• Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th edition	
Week 5	**Lecture 9**	• Number theory	• Discrete Mathematics with Applications, Susanna S. Epp, 5th edition • Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th edition	
	Lecture 10	• Number theory	• Discrete Mathematics with Applications, Susanna S. Epp, 5th edition • Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th edition	
Week 6	**Lecture 11**	• Methods of Proof and Disproof	• Discrete Mathematics with Applications, Susanna S. Epp, 5th edition • Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th edition	**Assignment 2**
	Lecture 12	• Methods of Proof and Disproof	• Discrete Mathematics with Applications, Susanna S. Epp, 5th edition • Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th edition	
Week 7	**Lecture 13**	• Sequences,	• Discrete Mathematics with Applications, Susanna S. Epp, 5th edition • Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th edition	**Quiz 2**
	Lecture 14	• Sequences, Mathematical Induction	• Discrete Mathematics with Applications, Susanna S. Epp, 5th edition • Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th edition	
Week 8	**Lecture 15**	• Mathematical Induction	• Discrete Mathematics with Applications, Susanna S. Epp, 5th edition • Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th edition	
	Lecture 16	• Mathematical Recursion	• Discrete Mathematics with Applications, Susanna S. Epp, 5th edition	

			• Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th edition	
Week 9	**Mid Term**			
Week 10	**Lecture 17**	• Recursively Defined Sequences	• Discrete Mathematics with Applications, Susanna S. Epp, 5th edition • Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th edition	**Assignment 3**
	Lecture 18	•Definition of Recurrence Relation; •Examples of • Recursively Defined Sequences	• Discrete Mathematics with Applications, Susanna S. Epp, 5th edition • Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th edition	
Week 11	**Lecture 19**	• Counting techniques,	• Discrete Mathematics with Applications, Susanna S. Epp, 5th edition • Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th edition	
	Lecture 20	• probability, Multiplication rule	• Discrete Mathematics with Applications, Susanna S. Epp, 5th edition • Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th edition	
Week 12	**Lecture 21**	• Permutations, Permutations of selected elements, Combinations,	• Discrete Mathematics with Applications, Susanna S. Epp, 5th edition • Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th edition	
	Lecture 22	•Combinations with repetitions and	• Discrete Mathematics with Applications, Susanna S. Epp, 5th edition • Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th edition	**Quiz 3**
Week 13	**Lecture 23**	• Combinations without repetitions	• Discrete Mathematics with Applications, Susanna S. Epp, 5th edition	**Presentation**

			• Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th edition	
	Lecture 24	• Introduction to Trees: Basic Concepts and Definitions	• Discrete Mathematics with Applications, Susanna S. Epp, 5th edition • Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th edition	
Week 14	**Lecture 25**	• Representations of Graph using the Lists	• Discrete Mathematics with Applications, Susanna S. Epp, 5th edition • Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th edition	
	Lecture 26	• Representations of Graph using the Matrices	• Discrete Mathematics with Applications, Susanna S. Epp, 5th edition • Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th edition	
Week 15	**Lecture 27**	• Representations of Graph using the Matrices	• Discrete Mathematics with Applications, Susanna S. Epp, 5th edition • Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th edition	**Assignment 4**
	Lecture 28	• Representations of Graph using the Matrices	• Discrete Mathematics with Applications, Susanna S. Epp, 5th edition • Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th edition	
Week 16	**Lecture 29**	• Efficiency of Algorithms	• Discrete Mathematics with Applications, Susanna S. Epp, 5th edition • Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th edition	**Quiz 4**
	Lecture 30	• Efficiency of Algorithms	• Discrete Mathematics with Applications, Susanna S. Epp, 5th edition • Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th edition	
Week 17	**Lecture 31**	• Regular Expression and Finite State Automata	• Discrete Mathematics with Applications, Susanna S. Epp, 5th edition	

			• Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th edition	
	Lecture 32	• Regular Expression and Finite State Automata	• Discrete Mathematics with Applications, Susanna S. Epp, 5th edition • Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th edition	
Week 18	**Final Term**			

VII. Course Material:

a. Recommended Text book :

1. Discrete Mathematics with Applications, Susanna S. Epp, 5th edition,
2. Discrete Mathematics and Its Applications, Kenneth H. Rosen, 7th edition
3. Logic and Discrete Mathematics: A Computer Science Perspective, Winifred Grassmann