Kingdom of Saudi Arabia
Ministry of Education
Jazan University
Faculty of Science
Mathematics Department

المملكة العربية السعودية
وزارة التعليم
جامعـــة جـــازان
كلية العلوم
قسم الرياضيات

(College of Computer Science)

Course Title: Discrete Mathematics (Math 107).

Second Semester 1441/1442 h (2020-2021)

Coordinator: Dr. Azeem Haider

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Prerequisite: Math 105.

Credit: 3 hours

Textbook:

- Discrete Mathematics and its applications, K.H. Rosen, McGraw-Hill, 6th edition (2007)

Scientific References:

- Discrete and Combinatorial Mathematics: An applied introduction, R.P. Grimaldi, Addison Wesley, 5th edition (2004)
- Donald Knuth et. Al, Concrete Mathematics: A foundation for computer science, Addison Wesley, 2nd edition (1994)
- John Dossey et al, Discrete Mathematics and its applications, Addison Wesley 5th edition (2006)

Course Description:

- **Mathematical logic:** propositional logic and propositional equivalence
- **Functions:** function of integers
- **Basics of counting:** permutation and combinations, binomial coefficients, generalized permutation and combinations
- **Advanced counting techniques:** recurrence relation, solving linear recurrence relation and generating functions
- **Graphs:** digraphs and undirected graphs, types of graphs and different properties
- **Trees:** types of trees and related results
- **Boolean algebra:** Boolean functions, representing Boolean functions and logic gates

Learning Outcome:

After finishing the course, the student is expected to be familiar with the followings:

- Mathematical logic
- Permutation and combination
- Generating functions and their applications in counting
- Graphs and its applications
- Trees method and its uses
- Boolean Algebras

Course Assessments:

- First Exam 20%
- Second Exam 20%
- Quizzes and homework 10%
- Final Exam 50%

Methods of teaching the course:

- Academic lectures
- Blackboard lectures
- Homework

Course Description in details:

Chapter title	*Topic/Activity*	*Due to*
Ch 1: The Foundations: Logic and proofs	**1.1 Propositional Logic** Definitions, examples, truth tables of compound propositions, tautology and contradiction.	**1st Week**
	1.2 Propositional Equivalence Propositional equivalence, logical equivalence and De Morgan's Law.	**2nd Week**
Ch 2: Functions	**2.1 Functions** Some important functions: floor and ceiling functions and its properties.	**3rd Week**
Ch 3: Boolean algebra	**3. 1 Boolean function** Definition, Boolean expression and Boolean functions, identities of Boolean algebra, duality **3.2 Representing Boolean functions** Sum of products expansions.	**4th Week & 5th Week**
Ch. 4: Logic gates	**4.1 Logic gates** Definition and combination of gates.	

Ch 5: Counting Principle	**5.1 Basics of counting** Basic counting principles and examples	**6th Week & 7th Week**
	5.3 Permutation and combinations Permutations, examples, combinations and examples	
	5.4 Binomial coefficients The binomial theorem, Pascal's identity and Triangle	
	5.5 Generalized permutations an combinations permutations with repetitions, combinations with repetitions, permutations with indistinguishable objects **Supplementary exercises.**	
Ch 6: Recurrence Relation	**6.1 Recurrence relation** Recurrence relations definitions and some examples	**8th Week & 9th Week**
	6.2 Solving linear recurrence relations Solving linear homogeneous recurrence relation with constant coefficients.	
Ch 7: Generating Functions	**Generating Functions** Definition, some facts about power series, some useful generating functions.	
Ch 8: Graph Theory	**8.1 Graph and graph models** Definition of graphs (directed and undirected) and example (influence graph)	**10th Week & 11th Week**
	8.2 Graphs terminology and special types of graph Basic terminology, degree of a vertex, isolated and pendant, in-degree and out degree**.**	
	8.3 Representing graphs and graph isomorphism Representing graph, adjacency matrices, and Incidence matrices.	**12th week & 13th Week**
Ch 9: Trees	**9.1 Introduction to Trees** Definition, examples of trees and graphs that are not trees, rooted tree, binary tree and spanning trees.	

Mid –Term Exams:
The first mid-term exam will be given during the 6th or 7th week.
The second mid-term exam will be given during the 11th or 12th week.