BAKI ALİ NEFT MƏKTƏBİ
BAKU HIGHER OIL SCHOOL

The Ministry of Education of the Azerbaijan Republic
The State Oil Company of the Azerbaijan Republic
Baku Higher Oil School

İnformation Technology Department

Information Security major (bachelor's degree)

Discrete Mathematics Fundamentals

Courses Syllabus

Fall, 2025

Instructor : Agha Aghayev

Course code : MATH 301 Course credit : 6

Office : Office hours : To be decided

Prerequisites:

Language of instruction: English

Schedule : Lecture, Tutorials

Web site : www.bhos.edu.az

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Description of the course

Propositions, inference rules, predicates, quantifiers, sets. Proof methods, proof by contradiction, induction. Numbers and their representations, prime numbers. Boolean algebra. Modular arithmetic, Eulers function and algorithm. Relations, functions, their types. Graphs, trees. Algebraic structures. Searching and sorting Algorithms, and their complexity.

Learning outcomes section

After taking this course students will be able to:

- Understand the foundational principles of discrete mathematics.
- Learning to proof basic mathematical properties
- Working with modular arithmetic, prime numbers
- Defining complexity of algorithms
- A basic understanding of algebraic structures and graph theory

Assessment methods

The exams can be written or multiple choice examination, class participation will be graded.

Grading

Exam	**Weight**	**Date minutes**	**Exam**
Final	60%	TBA (to be announced)	2 hours
Midterm	30%	6-7th week of the semester	1 hours
Class activity	10%		
Resit Final	60%		2 hours

RESIT EXAM

Resit exam will be done **only for the Final exam**, so there will **not** be a resit exam for the Midterm exam.

Area grading scale

A 91-100

B 81-90

C 71-80

D 61-70

F ≤ 60

Rules

Exams

In order to be excused from the exam, the student must contact the dean and the instructor before the exam. Excuses will not be granted for social activities such as trips, cruises and sporting events (unless you are participating). The exams will all be cumulative. Most of the questions on each exam will be taken from the chapters covered since the last exam. However, some will come from the earlier chapters. In general, the coverage will reflect the amount of the time spend in class on the different chapters.

Withdrawal (pass / fail)

This course strictly follows the grading policy of the Process Automation Engineering Department. Thus, a student is normally expected to achieve a total mark (preexam score + exam score) of at least 61 to pass. In this case of failure, he/she will be referred or required to repeat the course the following term or year.

Late policy

Late assignment submissions won't be accepted for grading. The grade for this assignment will be **zero**.

Teaching resources

Presentation : (will be provied)

Textbooks :

[1] Kenneth Rosen: "Discrete Mathematics and its applications", 7th edition, McGraw-Hill

[2] Seymour Lipschutz, Marc Lipson: Discrete Mathematics. (Shaum's Outline), 4th edition, 2009 Supplementary

For class presentations and discussions, the student should utilize journal and internet materials. Moreover, the course does not limit the use of learning materials available at BHOS library.

Attendance

The students are required to attend all classes as a part of their studies and those having legitimate reasons for absence (illness, family bereavement, etc.) are required to inform the instructor.

Professionalism and Participation

1. Attend class regularly, arrive on time, leave only when dismissed.

2. Attend class with all materials required, be prepared to listen and work.

3. Be well prepared for class, read all required materials, and complete all necessary preparation.

4. Be attentive in class, take notes, contribute to discussion and ask intelligent questions.

5. Demonstrate professional and respectful interpersonal relationships with peers and instructor: ATTITUDE COUNTS, AND whining is unacceptable.

6. Take responsibility for your actions, and your results.

Plagiarism

Honesty requires that any ideas or material taken from another source for written, visual, or oral use must be fully acknowledged. Offering the work of someone else as one's own is plagiarism. The language or ideas thus taken from another may range from isolated formulas, images, sentences or paragraphs to entire articles copied from books, periodicals, speeches, or the writings and creations of other students. The offering of materials assembled or collected by others in the form of projects or collections without acknowledgment also is considered plagiarism. Any student who fails to give credit for ideas or materials taken from another course is guilty of plagiarism.

Week	Topics	Textbook/Assignments
1	**Logic Basics** • Propositions, Negations, Conjunctions, Disjunctions • Implications: Converse, Inverse, Contrapositive, Biconditionals • Constructing Truth Tables	- Instructor's Presentations - Kenneth Rosen: "Discrete Mathematics and its applications", 7th edition, McGraw-Hill
	Tutorial 1: Exercises	
	Tutorial 2: Exercises	
2	**Applications of Logic** • Translating Propositional Logic Statements • Solving Logic Puzzles • Introduction to Logic Circuits • Logical Equivalences (De Morgan's Laws)	- Instructor's Presentations - Kenneth Rosen: "Discrete Mathematics and its applications", 7th edition, McGraw-Hill
	Tutorial 1: Exercises	
	Tutorial 2: Exercises	
3	**Predicate Logic & Quantifiers** • Predicate Logic • Quantifiers • Negating and Translating with Quantifiers • Nested Quantifiers	- Instructor's Presentations - Kenneth Rosen: "Discrete Mathematics and its applications", 7th edition, McGraw-Hill
	Tutorial 1: Exercises	
	Tutorial 2: Exercises	
4	**Boolean Algebra & Minimal Forms** • Boolean Variables and Functions • Boolean Identities and Laws • Simplification of Boolean Expressions • Minimal Forms (SOP, POS) • Karnaugh Maps and Logic Minimization	- Instructor's Presentations - Kenneth Rosen: "Discrete Mathematics and its applications", 7th edition, McGraw-Hill

	Tutorial 1: Exercises	
	Tutorial 2: Exercises	
5	**Proof Methods** • Direct Proofs • Proof by Contraposition, Contradiction • Proofs of Existence and Uniqueness • Mathematical Induction (Summation, Inequalities, Divisibility) • Strong Induction (Well-Ordering Principle) • Recursive Definitions & Structural Induction	- Instructor's Presentations - Kenneth Rosen: "Discrete Mathematics and its applications", 7th edition, McGraw-Hill
	Tutorial 1: Exercises	
	Tutorial 2: Exercises	
6	**Sets, Functions, and Big-O** • Basic Set Theory & Set Relationships • Set Operations and Identities • Functions (Introduction, One-to-One/Onto, Inverse, Composition) • Big-O, Big-Theta, Big-Omega (Complexity Basics)	- Instructor's Presentations - Kenneth Rosen: "Discrete Mathematics and its applications", 7th edition, McGraw-Hill
	Tutorial 1: Exercises	
	Tutorial 2: Exercises	
7	**Sequences, Recursion, and Algorithms** • Sequences, Recurrence Relations, Summations • Introduction to Algorithms and Pseudocode • Searching Algorithms • Sorting Algorithms • Recursive Algorithms	- Instructor's Presentations - Kenneth Rosen: "Discrete Mathematics and its applications", 7th edition, McGraw-Hill
	Tutorial 1: Exercises	
	Tutorial 2: Exercises	
8	**Number Theory Basics & Representations** • Divisibility • Modular Arithmetic • Number Representations (Decimal, Binary, Octal, Hexadecimal)	- Instructor's Presentations - Kenneth Rosen: "Discrete Mathematics and its applications", 7th edition, McGraw-Hill

	• Prime Numbers, GCD, Euclidean Algorithm, Linear Combinations • Solving Linear Congruences	
	Tutorial 1: Exercises	
	Tutorial 2: Exercises	
9	**Counting & Binomial Theorem** • Counting Rules • Permutations and Combinations • Binomial Theorem • Modeling with Recurrence Relations • Principle of Inclusion-Exclusion	- Instructor's Presentations - Kenneth Rosen: "Discrete Mathematics and its applications", 7th edition, McGraw-Hill
	Tutorial 1: Exercises	
	Tutorial 2: Exercises	
10	**Probability** • Discrete Probability Introduction and Practice • Probability Theory • Random Variables and Binomial Distribution	- Instructor's Presentations - Kenneth Rosen: "Discrete Mathematics and its applications", 7th edition, McGraw-Hill
	Tutorial 1: Exercises	
	Tutorial 2: Exercises	
11	**Relations, Graphs, and Trees** • Introduction to Relations, Properties, Combining Relations • Representing Relations (Matrices and Digraphs) • Equivalence Relations • Graph Theory Introduction, Terminology, Special Graphs, Applications. Trees	- Instructor's Presentations - Kenneth Rosen: "Discrete Mathematics and its applications", 7th edition, McGraw-Hill
	Tutorial 1: Exercises	
	Tutorial 2: Exercises	
12	**Review sessions**	

	Final Exam	

This syllabus is a guide for the course and may be updated, any modifications to it will be announced in advance.

Instructor of the course _____

Head of the department _____