BAKI ALİ NEFT MƏKTƏBİ
BAKU HIGHER OIL SCHOOL

Syllabus of Discrete Mathematics

Fall, 2024

Instructor: Dr. Samin Malik

Course code: MATH 305

Course credit hour: 6 credits

Office: 108, Campus Aypara

Office hours: Mon 16.00-18.00

Prerequisites: None

Language of instruction: English

Schedule : Lectures, tutorials

Web site : http://www.bhos.edu.az/az/staff/113-muallim-samin-malik/19

Email : samin.malik@bhos.edu.az

Description about course

Propositions, inference rules, predicates, quantifiers, sets. Proof methods, proof by contradiction, induction. Relations, functions, pigeonhole principle. Graphs, trees. Algebraic structures, partially ordered sets, lattices.

Course objective section

- To teach basic mathematical structures and methods needed for computer engineering studies.
- To develop mathematical modelling and abstract thinking skills.
- To introduce the importance and applications of formal methods.

Learning outcomes section

- Examining a simple system formally.
- Knowing the necessary inference rules and proof methods for constructing a mathematically valid proof.
- Knowing the applications of relations and functions and applying them to problems.
- Knowing the basic problems and solutions in graph theory and applying them to problems.

Assessment methods

The exams can be written or multiple choice examination. All questions must be answered.

Grading

Exam	Weight	Date	Exam minutes
Final	60%	TBA (to be announced)	120
Midterm	40%	6th week of the semester	50-60
Re-sit exam	60%		120

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. Excuse 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.

But 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 grading policy of the Chemical Engineering Department. Thus, a student is normally expected to achieve a mark of at least 40% 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 home works need not to be accepted for grading. (this is sample you can change the policy)

Teaching resources

Textbook : Discrete Mathematics

Core Textbooks:

Main

[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

[3]. Eric Lehman, Google Inc; F Thomson Leighton, Dept of Mathematics & CS, and CS and AI Laboratory, MIT; Albert R Meyer, Dept of EE & CS, and CS and AI Laboratory, MIT: ″Mathematics for Computer Science″ _(revised 6th June, 2018). - https://courses.csail.mit.edu/6.042/spring18/mcs.pdf

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

Attendence

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.

Tentative Schedule

Week	Lecture, tutorial, labs	Topics	Textbook, Assignments
1	L1	• Introduction to the course. • Sets and Functions. Set Operations.	[1], [2]
	L2	• Set Operations	[1], [2]
	L3	• Algebra of sets. • Cardinality of sets.	[2], [3]
	T1	• Exercises	[1], [2]
	T2	• Exercises	
2	L1	• Propositions	[2]
	L2	• Logical Operations. • Algebra of propositions.	[1], [3]
	L3	• Propositional functions (Predicates) and Quantifiers. • Algebra of Predicates. •	[1], [3]
	T1	• Exercises	[1], [2]
	T2	• Exercises	
3	L1	• Predicates and sets	[2], [3]
	L2	• Operations on sets	[1], [2], [3]
	L3	• Axiomatic set theory • Sizes and arithmetic	
	T1	• Exercises	[2], [3]
	T2	• Exercises	
4	L1	• Logic Gates and Circuits. Algebra of Circuits. •	[2], [3]
	L2	• Boolean Algebras. Sum-of-Product Forms (SoP); •	[2], [3]
	L3	• Minimal Boolean Expressions (MSoP). • Karnaugh Maps Method to find MSoP. • Truth Tables and Boolean Functions.	[2], [3]

	T1	• Exercises	
	T2	• Exercises	
5	L1	• Principle of Mathematical Induction I. •	[2], [3]
	L2	• Principle of Mathematical Induction II (Strong Induction).	[2], [3]
	L3	• Principle of Mathematical Induction II (Strong Induction).	[2], [3]
	T1	• Exercises	[2], [3]
	T2	• Exercises	
6	L1	• The Well-Ordering Property.	[1], [2], [3]
	L2	• Recursively Defined Functions.	[2], [3]
	L3	• Recursively Defined Sets and Structures. Structural Induction.	[2], [3]
	T1	• Exercises	[2], [3]
	T2	• Exercises	
7	L1	• Finite Sets, Counting Principles • Elements of Combinatorics	[2], [3]
	L2	• Sum Rule Principle. Product Rule Principle. • Inclusion–Exclusion Principle. • Pigeonhole Principle.	[2], [3]
	L3	• Factorial Function and Binomial Coefficients • Permutations and Combinations	[2], [3]
	T1	• Exercises	[2], [3]
	T2	• Exercises	
8	L1	• Relations •	[2], [3]
	L2	• Relations and their properties. • Operations over relations.	[1], [3]
	L3	• Function as a particular Case of a Relation. Equivalence Relation.	[1], [3]
	T1	• Exercises	[1], [3]
	T2	• Exercises	
9	L1	• Graphs and Graph Models, Representing Graphs	[1], [3]

	L2	• Connected Graphs, Eulerian and Hamiltonian Graphs.	[2], [3]
	L3	• Shortest Paths in weighted Graphs (Dijkstra Algorithm). Trees. Spanning Tree Algorithms.	[2], [3]
	T1	• Exercises	[2], [3]
	T2	• Exercises	
10	L1	• Intro to the notions of algorithm and complexity. Searching and	[2], [3]
	L2	• Growth of functions: Big-O, Big-Ω,_ and Big notations.	[2], [3]
	L3	• Sorting algorithms and complexity issues (additional reading).	[2], [3]
	T1	• Exercises	[2], [3]
	T2	• Exercises	
11	L1	• Languages and Regular Expressions.	[2], [3]
	L2	• Deterministic Finite State Automata (DFSA) and Language Recognition Problem.	[2], [3]
	L3	• Turing Machines	[2], [3]
	T1	• Exercises	
	T2	• Exercises	
12	Review sessions	• Sample Exam Paper Problems	
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	Review sessions	• Sample Exam Paper Problems	
	Review sessions	• Sample Exam Paper Problems	

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