

The Hebrew University of Jerusalem

Syllabus

DISCRETE MATHEMATICS - 80181

Last update 21-09-2016

<u>HU Credits:</u> 5

Degree/Cycle: 1st degree (Bachelor)

Responsible Department: mathematics

<u>Academic year:</u> 0

<u>Semester:</u> 1st Semester

<u>Teaching Languages:</u> Hebrew

<u>Campus:</u> E. Safra

Course/Module Coordinator: Dr. A Gurevich

Coordinator Email: gurevich@math.huji.ac.il

Coordinator Office Hours: Tue, 14-15

Teaching Staff:

Dr. Alex Gourevich Prof Eran Nevo Mr. Moshe White Mr.

Course/Module description:

1. Logic – Boolean operations, truth tables, propositional calculus and semantic 2. Set theory – operations on sets, Cartesian product, relations and functions, equivalence and order relations, partially ordered sets

3. Counting problems – counting with and without order importance, set partitions *4.* Identities - the binomial and multinomial formulas, combinatorial and algebraic proofs

5. Inclusion-exclusion principal – enumeration surjective maps, enumeration permutations without fixed point, Euler's function

6. Induction and recursion – proofs by complete induction, solving of combinatorial problems with the aid of recursion, Fibonacci numbers, solving recurrence relations, Catalan numbers, reflection method

7. Pigeonhole principle - Erdos-Szekeres theorem

8. Graphs – paths, connectivity, cycles, trees, bipartite graphs, planar graphs, polyhedrons, Euler's formula, Eulerian trails and cycles, Hamiltonian trails and cycles, matching, the marriage theorem

9. Graphs with additional structures – enumeration labeled trees, Cayley's formula, coloured graphs, Ramsey theory

10. Infinite sets – countable sets, Cantor diagonal, Koenig's lemma

Course/Module aims:

Providing basic notions of Discrete Math and developing the ability to solve problems.

Learning outcomes - On successful completion of this module, students should be able to:

solve elementary problems in set theory, combinatorics, and graph theory.

Attendance requirements(%):

none

Teaching arrangement and method of instruction: Lecture + exercise

Course/Module Content:

1. Logic – Boolean operations, truth tables, propositional calculus and semantic 2. Set theory – operations on sets, Cartesian product, relations and functions, equivalence and order relations, partially ordered sets

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<u>Required Reading:</u> none

<u>Additional Reading Material:</u> Nati Liniel, Michal Parnas, Discrete Mathematics (Hebrew)

<u>Course/Module evaluation:</u> End of year written/oral examination 90 % Presentation 0 % Participation in Tutorials 0 % Project work 0 % Assignments 10 % Reports 0 % Research project 0 % Quizzes 0 % Other 0 %

<u>Additional information:</u> none