Obuda University John von Neumann Faculty of Informatics	Institute of Applied mathematics			
Name and code: Discrete mathematics and Linear Algebra II. NMXDM2EBNE				
Credits: 5				

2019/20 year II. semester

Subject lecturers: Ágnes Záborszky				
Prerequisites (with code): Discrete Mathematics and Linear Algebra I., NMXDM1EBNE				
Weekly hours:	Lecture: 3	Seminar: 2	Lab. hours: 0	Consultation: for request
Way of assessment:	examination			
Course description:				
<i>Goal</i> : The aim of the course is to improve the abilities of students in concept formulation,				
abstraction, problem solving by means of becoming acquainted with the basic topics of finite				
mathematics and using them in problem solving and model creation.				
Course description: Partial ordering. Vector spaces, linear transformations. Proof by induction.				
Algebraic structures. Graphs, trees, applications. Elements of combinatorics (permutations,				
combinations).				

Lecture schedule				
Education	Topic			
week	Торіс			
1.	Homogeneous binary relations. Equivalence relations.			
2.	Partial ordering relations. Total order. Hasse-diagram. Least, greatest, minimal,			
	maximal elements. Least upper bound and greatest lower bound. Supremum and infimum as binary operations.			
3.	Lattices, sublattices, bounded lattices, distributive lattices, Birkhoff's theorem. Complements, Boolean algebras, Strict partial ordering			
4.	Vector spaces, examples. Linear combination, generated subspace, span, linear independence. Basis, dimension.			
5	Change of basis. Applications. Rank of a matrix. Systems of linear equations.			
6. Linear transformations and maps. Matrix representation. Examples. Compound				
	and inverse transformations.			
/.	Eigenvalues and eigenvectors of a linear transformation. Eigen subspace. 1 st test.			
8.	Basic concepts of graph theory. Paths, connectedness. Eulerian and Hamiltonian circuits.			
9.	Planarity. Trees. Euler's formula and colouring of graphs.			
10.	Algebraic structures, operation. Special properties of binary operations. Group-			
	like structures: one binary operation. Semigroup, monoid, group, abelian group.			
11	Order of a group, order of an element, Lagrange's theorem. Isomorphy.			
11.	Transformation, permutation groups.			
	Ring-like structures or Ringoids: two binary operations. Ring, field. Special			
12.	properties in rings. Lattice structures: two or more binary operations. Boolean-			
	algebra.			
13.	Combinatorics.			
14.	2 nd test. Test retake.			

Midterm requirements

Students are required to write two mid-term tests of 50 points. One of the tests can be retaken at the test retake.

Test retake is

- **compulsory** for those who missed one of the tests, otherwise they will be **banned** from further exams;
- **optional** for those who have written both tests but would like to achieve better grade. In this case the test with the lower score can be retaken, and its result will replace the original score (no matter if it is lower).

Students receive the end-term signature (and thus have the right to take the exam), if they have written the two tests, their overall score is at least 50, and their absence from classes does not exceed the allowed 30%.

Attendance at classes is compulsory. If absence exceeds the 30% of the total number of lessons, the student is banned from exams, teacher's signature is rejected and the student is not allowed to write the signature retake exam described below. In this case the student gets a "banned" entry in their credit book.

Midterm tests

Education week	Topic
7	Equivalence relations. Partial ordering, lattices.
	Vector spaces. Linear transformations.
14	Graphs. Algebraic structures. Combinatorics.
14	Retake

Signature retake exam

In case the student has written both mid-term papers, but their result is under 50%, and their absence at classes does not exceed the 30% of the total number of lessons, they have one opportunity to write a paper covering the whole course material in the exam-period. Students can register for the signature retake through the Neptun system after paying the appropriate registration fee. The test contains simple questions and students need to achieve at least 50% of the scores for the end-term signature.

Examination

The examination is written. The test contains theoretical questions and calculation exercises of the overall course material (altogether 70 points max). If the student does not reach at least 50% of the maximum score, the result is fail (1). Otherwise, 30% of their mid-term test result will be added to the exam score, thus a total 100 points can be achieved. In case the student fulfilled the signature requirements at the signature retake exam, their mid-term score is 15, regardless of the actual score. The final exam grade can be determined by the chart below

Final grade calculation methods

Score	Grade		
86-100	excellent (5)		
74-85	good (4)		
62-73	average (3)		
50-61	satisfactory (2)		
0-49	failed (1)		
References			

Mandatory: http://elearning.uni-obuda.hu Recommended: S. Lipschutz, M. Lipson: Discrete Mathematics