

<b>Institute of Applied Mathematics</b>						
Name of the subject: <b>Discrete Mathematics and Linear Algebra</b>		Code of the subject: NMXDM1EBNF	Credits: <b>4</b>	Weekly hours:		
				lec	sem	lab
				full-time	<b>2</b>	<b>2</b>
Responsible person for the subject: Magdolna Szőke				Classification:		
Subject lecturer(s): Ágnes Záborszky						
Prerequisites:						
Way of the assessment:			exam			
<b>Course description</b>						
<b>Goal:</b>	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.					
<b>Course description:</b>	Homogeneous binary relations, partial ordering, lattices. Graphs, trees, applications. Vector spaces, linear transformations.					

<b>Lecture schedule</b>	
<b>Education week</b>	<b>Topic</b>
1.	Properties of homogeneous binary relations: reflexive, irreflexive, symmetric, anti-symmetric, transitive. Equivalence relations, equivalence classes.
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.	Graphs, multigraphs, vertices, edges, degrees. Complete graphs, $r$ -regular graphs, bipartite graphs.
5.	Trails, paths, cycles. Adjacency- and the incidence matrices. Isomorphic graphs. Complement of a graph.
6.	Eulerian- and Hamiltonian graphs. Trees: properties, Prüfer code. Planar graphs, colouring.
7.	1st midterm test.
8.	Vector space, subspace. Linear combination, span. Linear independence. Basis, dimension.
9.	Transition from one basis to another. Rank of a matrix. Column space of a matrix.
10.	Linear transformations, their description by matrices. Compound transformations. Inverse transformations.
11.	Giving the properties of linear transformations by their matrices. Image space, kernel space.
12.	Eigenvectors, eigenvalues. Linear maps.
13.	2nd midterm test.
14.	Midterm test retake.

Mid-term requirements	
<b>Conditions for obtaining a signature</b>	<p>1. 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.</p> <p>2. Students are required to write two mid-term tests of 40 points. One of the tests can be retaken at the test retake. Test retake is</p> <ul style="list-style-type: none"> <li>• compulsory for those who missed one of the tests, otherwise they will be banned from further exams;</li> <li>• 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).</li> </ul> <p>3. Students are required to be prepared for the practice lessons and are expected to be active. Thus, during each practice lesson students will have to answer a short question related to the day's lesson material. The short question should be answered in 3-4 minutes each time and the correct answer will be worth 2 points. In this way, students can earn a total of 20 points over the course of the semester. The total score of the short questions will be added to the score of the midterm tests.</p> <p>4. In cases where academic dishonesty is suspected but not conclusively proven, the student will be required to demonstrate their knowledge through an oral examination conducted in front of a professional panel of three members. Should academic dishonesty be substantiated, disciplinary proceedings will be initiated, and the student will be barred from taking further examinations during the semester.</p> <p>Students receive the end-term signature (and thus have the right to take the exam), if their absences have not exceeded the permitted amount, if they have written both midterm tests, their overall score from the midterm tests is at least 40, and their total score from the midterm tests and the short questions is at least 50.</p>
Assessment schedule	
Education week	Topic
7	1st midterm test: written. Topics of weeks 1-6
13	2nd midterm test: electronic. Topics of weeks 7-12
14	Test retake
Method used to calculate the <i>mid-term grade</i> (to be filled out only for subjects with mid-term grades)	
Type of the replacement	
<b>Type of the replacement of written test/mid-term grade/signature</b>	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.

**Type of the exam** (to be filled out only for subjects with exams)

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, or does not reach 40-40% of the theoretical questions and the calculation exercises, the result is fail (1). Otherwise, 30% of their mid-term score 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, 15 points will be added to the exam score, regardless of the actual result of the signature retake exam.

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The final exam grade can be determined by the chart below:

**Calculation of the exam mark** (to be filled only for subjects with exams)

Score	Exam grade
86–100	excellent (5)
74–85	good (4)
62–73	satisfactory (3)
50–61	pass (2)
0–49	fail (1)

**References**

<b>Obligatory:</b>	Course materials in the Moodle system: <a href="http://elearning.uni-obuda.hu/">http://elearning.uni-obuda.hu/</a>
<b>Recommended:</b>	Seymour Lipschutz, Marc Lipson: Discrete Mathematics, 2007