Óbuda University John von Neumann Faculty of Informatics			Institute of Applied Mathematics	
Name and code of subject: **Credits*:*** 5 Discrete mathematics and Linear Algebra I. NMXDM1EBNE *Computer Engineering BSc Full-time course 2021/22 academic year, autumn*				
Subject lecturer: Ágnes Záborszky				
Prerequisites (with code):				
Periods per week:	Lectures: 3	Seminars: 2	Lab. hours: –	Consultation: as requested
Way of assessment:	examination			
Course description:				
Goal: Students are introduced to the basic concepts of linear algebra (vector geometry, matrix arithmetic, linear systems) as well as of propositional and predicate logic and sets, relations which are necessary for their posterior studies and for the common applications.				
Course description: Matrix arithmetic. Vector geometry, algebra of spatial vectors. Systems of linear equations. Propositional, predicate logic. Sets, relations, functions.				

Schedule	
Education week	*Topic*
1.	Determinants, properties, evaluation. Solution of linear systems with Cramer's rule.
2.	Matrix arithmetic: concept of matrices, types, operations. Adjugate, inverse of quadratic matrices.
3.	Linear systems: representation with matrices, solution with Gaussian elimination
4.	Vector geometry I.: concept of vectors, basic operations. Cartesian components, basis. Operations of vectors given with their coordinates. Scalar product. Applications.
5.	Vector geometry II.: Vector product. Applications. Triple scalar product. Applications.
6.	Vector geometry III. Equations of a straight line. Equation of a plane.
7.	1st test. Propositional logic I.: basic concepts.
8.	Propositional logic II.: Operations, properties. Formulae.
9.	Propositional logic III.: Evaluation of formulae: truth tables, Quine algorithm. Disjunctive and conjunctive normal forms. Karnaugh-Veitch method. Arguments, logical implication, formal proofs, natural deduction rules
10.	Predicate calculus I.: Predicate as a propositional function, universal set, universal- and existential quantifiers, bound and free variables.
11.	Predicate calculus II.: Writing statements using the symbols of predicate calculus, predicate language symbols, terms and formulae, rules for quantifiers.
12.	Sets, operations, Venn-diagram. Power-set. Cartesian-product. Relations, basic concepts. Binary relations, basic concepts, inverse relation, composition of relations.
13.	2nd test. Partial function, (total) function. Special properties of functions: injective, surjective, bijective..
14.	Test retake. Cardinality of sets. Countable and continuum cardinalities. Cardinality of power sets.

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.

Mid-term papers

Education week	Material
7	Determinants, matrix arithmetic, vector geometry, vector spaces.
13	Logic, sets, relations.
14	Test 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:

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

Literature

Compulsory:

Seymour Lipschutz, Marc Lipson: Discrete Mathematics, 2007
http://elearning.uni-obuda.hu/

Recommended:

S. Axler: Linear Algebra Done Right. Springer, 1997

J.K. Truss (ed.): Discrete Mathematics for Computer Scientists. Addison-Wesley, 1991