Obuda University John von Neumann Faculty of Informatics			Institute of Applied Mathematics	
Name and code of subject: Algebra and number theory NMXAS1PMNE *Applied Mathematics MSc* *Full-time course* *2019/20 academic year, spring*			**Credits: 4**	
Subject lecturers: dr. Magdolna Szőke				
Prerequisites (with code):	-			
Weekly hours:	Lecture:2	Seminar:	Lab. hours:	Consultation:
Way of assessment:	Final exam			

Course description:

Goal: Acquirement of basic algebraic and number theoretic notions and theorems, their application in exercises.

Course description: Operations, algebraic structures, basics of group theory, permutation groups, Cayley theorem, Lagrange theorem, normal subgroups, factor groups, homomorphisms, Isomorphism theorems, Sylow theorems, simple groups, soluble groups, nilpotent groups, Abelian groups, composition series, direct products, fundamental theorem of finite Abelian groups; free groups, basics of ring theory, commutative rings, ideals, factor rings, principal ideal domains, Noetherian rings, integral domains, fields, construction of fields, finite fields, field extensions, modules, algebras, basics of number theory, fundamental theorem of arithmetic, Euclidean algorithm, congruence, linear congruences, Euler's totient functions, quadratic congruences

Lecture schedule

Education week	*Topic*
1.	Operations, algebraic structures, basics of group theory
2.	Semigroups, basics of group theory
3.	Permutation groups, Cayley theorem, Lagrange theorem
4.	Normal subgroups, factor groups, homomorphisms
5.	Isomorphism theorems, Sylow theorems
6.	Simple groups, soluble groups
7.	Nilpotent groups, Abelian groups, composition series, direct products, Fundamental theorem of finite Abelian groups
8.	Basics of ring theory, commutative rings, ideals, factor rings
9.	Principal ideal domains, Noetherian rings
10.	Integral domains, fields, construction of fields, finite fields, field extensions
11.	Basic concepts of number theory (in integral domains)
12.	Fundamental theorem of arithmetic, unique factorisation domains. Euclidean algorithms, Euclidean rings, PID's.
13.	Rings of polynomials, Gaussian lemma, Schönemann-Eisenstein theorem / Midterm test
14.	Lie algebras (basic concepts) / Test retake

Midterm requirements

Attendance at lessons and seminars is compulsory.
Conditions of acquisition of a signature: students are required to write both midterm tests and the sum of their result must be at least 50% of the total 100 points.

Midterm tests schedule	
Education week	*Topic*
7.	Midterm test I
13.	Midterm test II
14.	Test retake

Type of replacement

The less successful test can be retaken in the last week, as well as a non-written test if a medical certificate is presented.

Type of exam

The exam is written and consists of theoretical questions (40pts) and exercises (30pts). 50% of the scores must be achieved at each part in order to pass the exam. The final grade is calculated from the sum of the scores achieved in the exam and 30% of the scores of the midterm tests as follows: 50-61 points: passed (2), 62-73 points: satisfactory (3), 74-85 points: good (4), 86-100 points: excellent (5).

References

Obligatory: Lecture notes (download form https://elearning.uni-obuda.hu/)

Recommended: