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| **Institute of Applied Mathematics**  | Semester 1. of the curriculum 2023-24-1  |
| Name of the subject:  | Code of the subject:  | Credits:  | Weekly hours:  |
|   | lec  | sem  | lab  |
| **Algebra and number theory**  | NMXAS1EMNF  | 4  | full-time  | 2  | 0  | 0  |
| Responsible person for the subject: Dr. SZŐKE Magdolna  | Classification: senior lecturer  |
| Subject lecturer(s):   |
| Prerequisites:  |   |   |
| Way of the assessment:  | exam  |   |   |
| **Course description**  |
| Goal:  | Acquirement of basic algebraic and number theoretic notions and theorems, their application in exercises.  |
| Course description:  | Operations, algebraic structures, concept of semigroup. Basics of group theory, examples of groups: cyclic, dihedral, symmetric and linear groups. Lagrange theorem, normal subgroups, factor groups, homomorphism theorem. Sylow theorems. Direct products, fundamental theorem of finite Abelian groups; simple groups. Basics of ring theory: subrings, ideals, factor rings. Integral domains, principal ideal domains, fields. Basics of number theory in integral domains, Euclidean domains. Basic concepts of Lie algebra, examples.  |
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| **Lecture schedule**  |
| Education week  | Topic  |
| 1.  | Properties of operations, notion of semigroup.  |
| 2.  | Notion of group, examples. Subgroups, Lagrange’s theorem.  |
| 3.  | Normal subgroups, factor groups, homomorphism theorem.  |
| 4.  | Conjugacy classes, centraliser, centre.  |
| 5.  | Sylow's theorems.  |
| 6.  | Direct product, fundamental theorem of finite Abelian groups.  |
| 7.  | Notion of simple group, examples.  |
| 8.  | Notion of ring; subrings, ideals, factor rings.  |
| 9.  | Integral domains, principal ideal domains, fields.  |
| 10.  | Elements of number theory in integral domains.  |
| 11.  | Euclidean algorithms, Euclidean domains.  |
| 12.  | Notion of Lie algebra, examples. Lie subalgebras, ideals, factor algebras.  |
| 13.  | Midterm test  |
| 14.  | Test retake  |
| **Mid-term requirements**  |
| Conditions for obtaining a mid-term grade/signature  | To gain at least 50% of the scores at the midterm test.  |
| **Assessment schedule**  |
| **Education week**  | Topic  |
| **13.**  | The material of the whole term  |
| **14.**  | Same  |
|   |   |
| **Method used to calculate the *mid-term grade*** (to be filled out only for subjects with mid-term grades)  |
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| **Type of the replacement**  |
| Type of the replacement of written test/mid-term grade/signature  | The signature can be acquired in the signature retake exam (during the first 10 days of the examination period).   |
| **Type of the exam** (to be filled out only for subjects with exams)  |
| Oral  |
| **Calculation of the exam mark** (to be filled only for subjects with exams)  |
| 30% from the midterm test, 70% from the oral exam  |
| **​​Final grade calculation methods:​**  |
| 0-49%: fail 50-61%: pass 62-73%: satisfactory 74-85%: good 86-100%: excellent  |
| **References**  |
| Obligatory:  | D. S. Dummit and R. M. Foote: Abstract algebra, Wiley, 2004.  |
| Recommended:  |   |
| Other references:  | Lecture notes uploaded to the e-learning system of the university  |