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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 | | | | | | | |
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| **Method used to calculate the *mid-term grade*** (to be filled out only for subjects with mid-term grades) | | | | | | | | | |
|  | | | | | | | | | |
| **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 | | | | | | | | |