# Syllabus

1. (September 4, 5.) Fundamentals of number theory, theorems about primes (1.1). Congruences (1.2).
2. (September 11.) Linear congruences. Simultaneous congruence systems (1.4).
3. (September 18, 19.) Euler-Fermat theorem, little Fermat theorem (1.3). Number theoretic algorithms: basic operations, exponentiation (1.5.1-1.5.3).
4. (September 25, 26.) Euclidean algorithm, its application for solving linear congruences (1.5.4-1.5.5). Primality testing, public key criptography, RSA-encoding (1.5.6-1.5.7).
5. (October 3.) Geometry of 3-space: equations of planes, lines; intersections (2.1).
6. (October 9, 10.) $\mathbf{R}^n$, operations in $\mathbf{R}^n$. Subspaces of $\mathbf{R}^n$. Linear combination, spanned (generated) subspace, generating system (2.2.1-2.2.3).
7. (October 16, 17.) Linear independence. Exchange theorem, I-G inequality (2.2.4-2.2.5).
8. (October 24.) Basis, dimension, standard basis, the dimension of $\mathbf{R}^n$ and its subspaces (2.2.6).
9. (October 30, 31.) Systems of linear equations, Gaussian elimination. Conditions on solvability and uniqueness (2.3). Definition of determinants (2.4.1-2.4.2).
10. (November 3.) **First midterm**. Material: up to dimension (1.1-2.2).
11. (November 6, 7.) Determinants: ways of evaluation, expansion theorem. Cross product (2.4.3-2.4.7).
12. (November 13, 14.) Matrices, operations on matrices. Product theorem for determinants. Connection between systems of linear equations and matrix equations (2.5.1-2.5.2).
13. (November 20, 21.) Inverse of a matrix, necessary and sufficient condition for its existence, calculation of the inverse. Rank of a matrix (2.5.3-2.5.4).
14. (November 27, 28.) Linear maps. Matrix of a linear map. Composition (product) of linear maps. Inverse of a linear transformation. Kernel and image of linear maps. Dimension theorem (2.6.1-2.6.4).
15. (December 1.) **Second midterm**. Material: up to rank (2.3-2.5).
16. (December 4, 5.) Changing bases, the matrix of a linear transformation in a given basis. Eigenvalues and eigenvectors of matrices, characteristic polynomial. Diagonalisation (2.6.5-2.6.6).

The numbers in parentheses denote the chapters and sections in the Lecture Notes.