Syllabus

1. Fundamentals of number theory. Congruences.
2. Linear congruences, their solvability and methods for their solutions. Linear diophantine equations, simultaneous congruence systems. Euler-Fermat theorem, little Fermat theorem.
3. Polynomial algorithms. Number theoretic algorithms: basic operations, exponentiation, Euclidean algorithm, its application for solving linear congruences.
4. Primality testing, public key criptography, RSA-encoding.
5. Geometry of 3-space: equations of planes, lines; intersections.
6. $\mathbf{R}^n$, operations in $\mathbf{R}^n$. Subspaces of $\mathbf{R}^n$. Linear combination, spanned (generated) subspace, generating system, linear independence.
7. Exchange theorem, I-G inequality, basis, dimension. Standard basis, the dimension of $\mathbf{R}^n$ and its subspaces.
8. Systems of linear equations, Gaussian elimination. Conditions on solvability and uniqueness.
9. Determinants, ways of evaluation, expansion theorem. Cross product and mixed product in 3-space.
10. Matrices, operations on matrices. Product theorem for determinants. Connection between systems of linear equations and matrix equations.
11. Inverse of a matrix, necessary and sufficient condition for its existence, calculation of the inverse. Rank of a matrix.
12. Linear mappings. Matrix of a linear mapping. Composition (product) of linear mappings. Inverse of a linear transformation.
13. Kernel and image of linear mappings. Dimension theorem. Changing bases, the matrix of a linear transformation in a given basis.
14. Eigenvalues and eigenvectors of matrices,characteristic polynomial. Diagonalisation.