

Taras Shevchenko National University of Kyiv

Physics Department

Course description

**Analitic Geometry & Linear Algebra**

**Level: Language: Duration: Occurrence:**

Bachelor Ukrainian 2 semesters 1st&2nd semesters

**Credits: Total Hours: Lectures: Seminars:**

7 210 90 hrs 120 hrs

**Description of Course Work and Examinations**

Module-rating system, results are estimated on a 100-point scale. The course contains 6 short quizzes for

2.5 pts/15 min each, two midterms for 20 pts/180 min each, high-difficulty problemset for 15 pts that should be completed during the semester and the final exam for 30 pts / 180 min.

**Prerequisites**

School-level math

**Syllabus (1st semester)**

1. Matrix: definition and properties
2. Subtraction of matrices. Zero matrix
3. Transposition of matrices. Symmetric and asymmetric matrices. Pauli matrices.
4. Linear combinations
5. Linear independent system of matrices and its properties
6. Determinant of matrix and its properties
7. Methods of calculating determinants
8. First Minor. Minor of order k. Complement
9. Basis minor and rank.
10. Theorems about basis minor and rank
11. Multiplication of matrices
12. Determinant of a multiplication
13. System of linear equations (SLE). General task. Consistent and inconsistent
14. Cramer’s rule
15. Gauss method of solving SLE
16. Inverse Matrix: definition, properties and evaluation
17. Rouche-Capelli theorem
18. Solution set. Fundamental set of solutions
19. Vector space
20. Dimensions of the vector space
21. Basis of vector space
22. Coordinates of a vector with respect to a basis
23. Basis change. Basis change matrix.
24. Scalar product of geometrical vectors
25. Euclidean Space
26. Length of a vector in Euclidean space, Cauchy-Bunyakovsky inequality and its generalization
27. Ortonormal system of vectors.
28. Gram-Schmidt process
29. Gram matrix and its properties
30. Orthogonal matrix

**Syllabus (2nd semester)**

**Literature**

1. V. Ilyin, E. Pozniak *Linear Algebra* Moscow 1984, 280p., ISBN: 978-5-9221-0481-4

**Lecturer/seminarian**

Professor Stanislav Vilchinskiy/ Assistant Professor Lidiya Zadorozhnya