

NATIONAL TECHNICAL UNIVERSITY OF UKRAINE "IGOR SIKORSKY KYIV POLYTECHNIC
INSTITUTE"

PHYSICO-MATHEMATICAL FACULTY

APPROVED

Academic Council

Physics and Mathematics Faculty

Record No. 1 of February 23, 2017

Chairman of the Academic Council _____V. Vanin

PROGRAM

For additional entrance exam

On the educational-professional program of postgraduate training

Specialty 111 Mathematics

The program is recommended by the department
Mathematical analysis and theory

Probabilities

Record No. 6 dated February 22, 2017

Head of the Department _____ O.I. Klesov

Kyiv – 2017

1. INTRODUCTION

In modern science and technology, mathematical methods of research, modeling and Designing play an important role. An important task of the higher course Mathematics is the development of logical and algorithmic thinking students, skill to conduct mathematical analysis of applied tasks. This program is from the highest Mathematics reflects the new demands placed on mathematical education of the XXI century. It is characterized by applied orientation and orientation towards use Mathematical methods, special attention to probabilistic-statistical methods in Connection with its practical significance. The general course of mathematics is the foundation of mathematical training.

Disciplines, the content of which is included in the program, belong to the cycle of mathematical Disciplines the purpose of this test is to test basic skills and Incoming skills in solving mathematical problems, which are the basis for the study of the characteristics of processes, knowledge of the basic principles and laws Mathematical disciplines; The ability to reproduce mathematical models, quantitatively to formulate and solve mathematical problems, the presence of boundaries Application of mathematical models and theories.

Applicants must fully understand the fundamental laws Mathematics, as well as methods of their research, be able to apply this knowledge at considering individual phenomena, combining their essence with analytical relations, to be able to use knowledge of the courses of basic mathematical disciplines, with studying other disciplines, both general engineering and specialty.

Each entrant receives a ticket, which contains three theoretical questions on math. Preparation of the response is given 90 minutes.

II. KEYWORD

The program of additional testing is compiled on the basis of programs of the following disciplines:

«Topology», «Differential geometry», «Variation calculus and methods of optimization», "Mathematical logic", "Theoretical mechanics" - and contains the following sections:

Section 1. Variation calculations and optimization methods

1. Relationship of the problems of the variational calculus with optimization tasks and Optimal control.
2. Classical problems of the variational calculus and optimization problems of mathematical Physics
3. Methods of constructing approximate solutions of variational problems in Parametric classes of functions.
4. Conditions of optimality and extreme solutions of variational problems. Equation Euler.
5. Variational tasks with constraints. Generalized theorems of Karush-Kun-Tucker
6. Gradient methods for constructing solutions of complicated variational problems.
7. Second variation and sufficient conditions of extremum. Legendre's theorem.
8. Direct methods of variation calculus. Ritz and Galerkin methods.
9. Conditions of optimality of solutions of variational problems for many functions Variables.
10. Conditions of the optimality of solutions of variational problems for the functionals from Functions and their derivatives of higher orders. Euler-Poisson equation.

11. Variational principles.
12. Optimal control tasks. Multicriteria optimization tasks.

Section 2. Mathematical logic.

1. Logical operations on statements. Tables of truth. Tautology
2. Equivalence of formulas of algebra of utterances. Conjunctive and Disjunctive normal forms.
3. Boolean functions. Theorem on functional completeness. Logical follow up on the basis of algebra of utterances.
4. Alphabet number of statements. Rules of formation. Construction of the calculus Utterances
5. The concept of a predicate. Logical operations on predicates. Quantum Logically General meaningful formulas of predicate logic.
6. Application of symbols of mathematical logic in mathematical Wording

Section 3. Topology.

1. Topology and topological spaces.
2. Metric and metric spaces. Topology induced by metric.
3. Open sets, times, inside, isolated points.
4. Closed sets, closure of a set, boundary points.
5. Subspace of topological spaces. Induced topology.
6. Continuous display. Homeomorphisms

Section 4. Differential geometry.

1. Curve, elementary, simple, regular. Ways of setting the curve. Special Points of regular flat curves.
2. Asymptotes of plane curves. Vector-function of a scalar argument, Properties.
3. The tangent curve. Equations tangent to the curve. Stretchy (with curve) plane.
4. Steady curves. Circuit family of curves.
5. Length of curve: natural parameterization. Curvature of the curve.
6. Squat the curve. Formula Fresnel.
7. A theorem on the complete problem of the surface with its curvature and difficulty.
8. Flat curves. Evolute, evolution of a flat curve.
9. Tangential plane and normal to the surface. The surface is stiff with a curve.
10. Stylic sphere. Stylish paraboloid: classification of points of the surface.
11. Ovvidnye family of surfaces. By-pass families of planes, dependent on each other The parameter.
12. The first quadratic form. Length of surface lines. The angle between the lines on The surface

Section 5. Theoretical mechanics.

1. Kinematics point.
2. Kinematics of the solid.
3. Relative movement.
4. Statics.

5. General dynamics theorem.
6. Part of the task of point dynamics.
7. Dynamics of non-free systems of material points.
8. Movement of the system of material points in the potential field.
9. Small fluctuations.
10. Dynamics of an absolutely rigid body.

III FINAL PROVISIONS

1. Support materials.

The exams do not allow the use of additional literature.

2. Evaluation criteria.

The examination ticket consists of three theoretical questions in mathematics.

The assessment system evaluates the ability of the entrant:

- - generalize the knowledge acquired to solve specific problems, problems;
- apply rules, methods, principles, laws in specific situations;
- analyze and evaluate the facts, events and make substantiated conclusions;
- interpret circuits, graphs, diagrams;
- to present the material logically, consistently, in accordance with the requirements of the standards.

The answer for an entrant is estimated on a 100-point scale (33-34 points for each question). The correct answer is a complete and adequate coverage of the issue

According to the Supplemental Entrance Testing Program

After that, the transfer of these marks into ECTS assessment according to the table is carried out:

Amount of points scored	Score
95...100	A
85...94	B
75...84	C
65...74	D
60...64	E
Less 60	F