

NATIONAL TECHNICAL UNIVERSITY OF UKRAINE  
"Igor Sikorsky Kiev Polytechnic Institute"

PHYSICO-MATHEMATICAL FACULTY

APPROVED

Academic Council

Physics and Mathematics Faculty

Minutes No. 2 of April 6, 2017

Chairman of the Academic Council \_\_\_\_\_ V.V. Vanin

PROGRAM  
OF ADDITIONAL INTRODUCTION  
TRIAL

The third (educational-scientific) level of higher education  
For the degree of doctor of philosophy  
Field of Knowledge 13 Mechanical Engineering  
SPECIALTY 131 Applied Mechanics  
SPECIALIZATION Applied geometry, engineering graphics

Program developers:

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Anatolievich Descriptive geometry,  
engineering and  
Computer graphics \_\_\_\_\_

Accepted by the Academic Council  
Faculty of Physics and Mathematics  
(Minutes from April 6, 2017, No. 2)

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## I. INTRODUCTION

This program contains information about the content of the training material, which is made on the additional entrance exam of the third (educational-scientific) level of higher education for obtaining the degree of a doctor Philosophy in the field of knowledge "Mechanical Engineering", specialty "Applied mechanics ", specialization" Applied geometry, engineering graphics ".

Additional introductory tests are subject to entry to postgraduate studies in another field of specialization than that indicated in them master's degree (specialist).

Additional introductory tests are rated on the scale "enrolled" "Uncredited". The entrant who has received "uncredited", before making further entrance exams are not allowed.

The purpose of the additional introductory test is to clarify the quality basic knowledge and available skills of entrants from the chosen educational and scientific direction of professional training. During the entrance exam the evaluation of the basics of theoretical training of apprentices, their abilities, ability to think logically, perform typical practical tasks.

This program consists of an introduction, a list of educational material, which is made on the introductory test, the recommended literature, evaluation criteria and example exam paper.

An introductory test is conducted orally at the exam tickets. When answering the proposed questions is necessary demonstrate good theoretical knowledge and appropriate practical skills.

Each exam paper contains three theoretical questions respectively from the section "Applied Geometry", "Engineering Graphics", "Computergraphics. "

The main task of this program is to provide the opportunity successfully prepare for the entrance exam.

## II. LIST OF EDUCATIONAL MATERIAL

### SECTION 1. APPLIED GEOMETRY.

#### 1.1. Analytical geometry.

Cartesian coordinates on a plane and in space. Algebraic equations straight lines, circles and planes. Types of conical sections. Vectors and operations over them. Orthogonal coordinate transformations.

#### 1.2. Descriptive geometry.

Projection method. Central, parallel and orthogonal

Projection Orthogonal projection of points, straight lines and planes.

Transformation of orthogonal projections by the method of replacing projection planes.

Intersection of straight and planes. Determination of the true length of the straight line the segment by its orthogonal projections. Rectangular isometry.

#### 1.3. Differential geometry.

Parametric curves of the line. The tangent and curvature of the flat line.

Parametric Linear Surfaces. Geodetic lines. Created curves and the surface

## SECTION 2. ENGINEERING GRAPHICS.

### 1.1. Machine-building drawing.

Geometric constructions Drooping General rules of registration  
Shredders Images (views, cuts, cross-sections). Sizing.  
Typical detail elements. Pullovers of parts and folding units.  
Connections are demountable and non-detachable. Specifications.

### 2.2. Graphic tools in modern automated systems

Design (CAD).  
Technical and software graphic tools CAD. Automated geometric modeling of technical objects.  
Automation tools geometric constructions.

## SECTION 3. COMPUTER GRAPHICS.

### 3.1. Basic provisions of computer geometric modeling.

Raster and vector graphics. Basic methods and methods of geometry constructions

### 3.2. Modern computer graphic technologies.

Automated construction of points, lines, surfaces and bodies in systems automated design

### 3.3. Mathematical foundations of computer graphics

Converting coordinates on a plane and in three-dimensional space (Parallel transfer, rotation, zoom and symmetry). Curves Bezier.  
The surfaces of Bezier and Kuns.  
Solid-state modeling. Application of Boolean operations.

## III. CRITERIA OF EVALUATION OF INTRODUCED EXPIRES

During the exam, admitters are prohibited from using any one auxiliary literature in paper, electronic form, etc. The examination score consists of the points that an entrant receives for answers to questions of a ticket: maximum 35 points for the first and second question and a maximum of 30 points for the third question.

Thus, the answer of an entrant is estimated on a 100-point scale.

Criteria for assessing answers to the first and second questions:

- 33 ... 35 points - the correct complete answer;
- 30 ... 32 points - the correct complete answer with minor inaccuracies;
- 26 ... 29 points - the correct answer is sufficient enough with a minor inaccuracies;
- 23 ... 25 points - basically the correct, somewhat incomplete answer;
- 21 ... 22 points - basically the correct somewhat incomplete answer from individual errors;
- Less than 21 points - incomplete answer with significant mistakes.

Criteria for assessing answers to the first and second questions:

- 28 ... 30 points - the correct complete answer;
- 25 ... 27 points - the correct complete answer with minor inaccuracies;

22 ... 24 points - the correct answer is sufficient enough with minor ones inaccuracies;

20 ... 21 points - basically correct, somewhat incomplete answer;

18 ... 19 points - basically the correct somewhat incomplete answer from individual errors;

Less than 18 points - incomplete answer with significant mistakes.

The total number of points is determined by summing the points on ticket question the conversion of the points obtained into the ECTS score is performed according to the following table.

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