

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
National Aviation University
Educational and Research Institute of Airports
Computer Technologies of Design and Graphics Department

APPROVED
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Quality Management System

SYLLABUS
on
«Engineering Graphics»

Field of Study: 15 «Automation and Instrumentation»
Speciality: 151 «Automation and Computer-integrated Technologies»
Specializations: «Computer-integrated technological processes of production»

Year of Study – 1st

Semester – 1st

Classroom Sessions – 51


Self-study – 54

Graded Test – 1st semester

Total (hours/ECTS credits)– 105/3,5

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The Syllabus on “Engineering Graphics” is based on the educational and professional program and Bachelor Curriculum № CB-14-151/16 for Speciality 151 «Automation and Computer-integrated Technologies» and Specializations: «Computer-integrated technological processes of production» and correspondent normative documents.

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" _____ " _____ 2017.

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1. EXPLANATORY NOTES

The Syllabus on "Engineering Graphics " is developed on the basis of "Methodical instructions for development and issuance of syllabus and course training programs of the subjects" enacted by order as of 16.06.2015 №37/рз.

This education discipline is the theoretical basis and practical body of knowledge and skills that form the basis of general engineering education and establishes links between the general scientific and special disciplines Curriculum.

The purpose of teaching of discipline is opening of modern scientific conceptions, notions and methods of display geometrical properties of technical objects in the form of design drawings of requirements of international, national and departmental standards.

Objectives to study the subject are:

- mastering of theoretical basics of modeling techniques and research the geometric properties of technical and natural objects as design documents;
- development of mental abilities playback spatial forms of flat images;
- mastering the basic rules and norms of design and execution drawings and other design documents established by international standards of ЄСКД;
- mastering the basics of automated execution using graphic documentation software packages.

As the result of mastering the discipline a student should:

To know:

- the essence of method of projections;
- graphical methods for solving the problem of geometric design related mainly to the definition of the shape, size and relative position of objects on the drawing;
- requirements of international, national and institutional standards to the design development documents;

To be able:

- independently perform the following documents design drawings~ detail specification, assembly drawings, circuit explanatory note using the drawing tools and a personal computer using graphic and text software;
- self-renew in the mind spatial prototypes of actual or planned products, their shape, size with a flat projection imaging (to read drawings).

Educational material of discipline is structured on the module principle and consists of two educational Modules, namely:

- educational **Module №1 «Projection bases of images»**;
- educational **Module №2 «Development of working design documentation»**,

each of which is logically complete, relatively independent, integral part of the educational discipline, learning of which provides for Module test and analysis of its implementation.


Educational discipline "Engineering Graphics" based on knowledge of such disciplines as: "Higher Mathematics", " Computer technology and programming", "Electronics and electrical engineering" and there is a base to study of educational disciplines "Design automation systems", " Technical devices of automation", "Identification and modeling of technological objects"

2. SUBJECT CONTENT

2.1. Module №1 «Projection bases of images».

Topic 2.1.1. Introduction. Bases of geometric modelling. Orthogonal projections of point, straight line, plane.

Basic concepts of geometric modeling space. Method of two images. The projection

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model which consisting of the orthogonal projections of points of the object on mutually perpendicular plane of projections. Multiview drawing of Monge.

Complex drawing of point. Quarter and signature of points. Defining the relative disposition of a pair of points. Complex drawing of line. Properties of projections in relative to the plane of projections: oblique, level, proekting. Determining the length of segment and angles of inclination the oblique straight line. Complex drawing of plane. Properties of projections of plane by changing their position relative to the planes of projections: oblique, level, projekting. Belonging point and line to plane. Displays the relative position of the plane and straight line: intersecting objects, parallel objects.

Topic 2.1.2. The basic rules of design documentation. Projection bases of images: views, sections and cross-sections.

Systems standardization. Unified design documentation (ЄСКД). Definition of the product. The structure established by ГОСТ 2.101 - 68 kinds of products, parts, assembly units, complex set.

Characteristics of design documents by ГОСТ 2.102 - 68. Determination of the basic document for the design of products. Basic and a complete set of design documents.

Basic rules of design drawings on interstate standards - formats (ГОСТ 2.301 - 68), scale (ГОСТ 2.302 - 68), line (ГОСТ 2.303 - 68), fonts drawing (ГОСТ 2.304 - 81), the major labels (ГОСТ 2.104: 2006) , application size (ГОСТ 2.307 - 68).

The main provisions of the imaging ГОСТ 2.305 - 68. Determination of the species. Basic, advanced and native species. Determination of cut poznaka conventional materials in sections and sections according to ГОСТ 2.306 - 68. Simple and complex cuts. Terms of the combination of the type and cut. Sit. Definitions section. Sectional handed imposed in rupture of the main image. Conventions and simplify the performance of images. Execution of technical drawings forms.

Topic 2.1.3. Graphical editor AutoCAD. Algorithms construction drawings of parts among the graphic editor AutoCAD.

Definition of computer graphics (CG) by ДСТУ 2939 - 94. Areas of application CG and the main problems. CG technical devices: electronic computers, input devices and display devices of this exchange, the output device. Software of CG. Characteristics of software for engineering: КОМПАС, AutoCAD, Solid Works.


The system AutoCAD: general information, appointment system, user interface, team building and editing geometric "primitives", application size.

2.2. Module №2 «Development of working design documentation»

Topic 2.2.1. Working drawings of parts.

Definition of detail drawings as design document in accordance with ГОСТ 2.101-68. Requirements for working drawings of detail in accordance with ГОСТ 2.109-73 and their practical implementation of the performance parts drawings from nature:

- analysis form of detail as a combination of simple geometric shapes oriented in some way to each other and related operations of union, intersection, or subtraction;
- choice of minimal but sufficient number of images (views, sections, cross-sections, remote elements) to manufacture of parts;
- choice of bases and measurement of detail and its parts with followed by put the required size drawings in accordance with ГОСТ 2.307 – 68;
- determine surface roughness of detail and its designation in the drawing in accordance with the requirements of ГОСТ 2.309 - 73;
- record of technical requirements for the details - heat treatment, protective covers and others;
- filling the main drawing inscriptions.

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Features of working drawings of details of the "Shaft","Body". Drawings detail the standards of 4 ЄСКД (springs, gears, pipes).

Execution drawings of parts for the specimens.

Topic 2.2.2. Types of connections of parts of the product. Their images and symbols

Methods of detachable and non-detachable connections of details.

Classification of detachable joints on structural features (threaded, key, spline, pin, articulation). Formation of thread, their classification, basic parameters, conventional image of thread by ГОСТ 2.311 - 68. Designation of standard fasteners threads. Standard fasteners with thread for standards of general engineering and the aviation industry. Conventions and simplification when performing image connections with standard fasteners with the thread in accordance with the requirements of ГОСТ 2.315 - 68. Threaded connection of pipelines on the outer cone.

Rules of execution of drawings of some non-detachable connections of details: rivets, welding by ГОСТ 2.312 - 68, soldering and gluing by ГОСТ 2.313 - 68.

Execution of drawings threaded connections at baseline.

Topic 2.2.3. Drawings detailing the general form of assembly unit.

The rules of reading and analysis of the general view drawings of assembly unit to determine its structure, how connections between themselves parts, order assembly of the product. Determining the geometric shape and size of parts that are assembly unit.

Development of detail drawings for the general view drawings of assembly unit.

Topic 2.2.4 Rules of execution drawings of printed circuit boards.

Terms and definitions of basic concepts in the field of printed circuit boards, which sets the ДСТУ 2646-94. The main recommendations of the PCB design according to ГОСТ 10317-79: the size of the PCB, pitch grid, diameters and mounting vias. The basic rules of PCB drawings by ГОСТ 2.417-91.

Topic 2.2.5. The basic rules of graphic design of electrical circuits .


Definition of scheme for ДСТУ 3321: 2003. General requirements for schemes by ГОСТ 2.701 - 84. Kinds and types of schemes. The rules of implementation of electrical circuits in accordance with ГОСТ 2.721-74 -2.758-81. Alphanumeric designation according to ГОСТ 2.710-81.

Development of principle electrical circuit among the graphic editor AutoCAD.

3.LIST OF REFERENCES

3.1. Basic literature

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3.1.2. *Ванін В .В.* Оформлення конструкторської документації: навч. посіб. 4-те вид., випр. і доп. / В. В. Ванін, А. В. Блюк, Г. О. Гнітецька. - К. Каравела, 2012. - 200 с.

3.1.3. *Макаренко М.Г.* Інженерна графіка: посібник / М.Г. Макаренко. - К.: НАУ. 2014. – 180 с.

3.1.4. *Макаренко М.Г.*:Комп'ютерна графіка: практикум / М.Г. Макаренко. К.: НАУ. 2013. - 76 с.

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3.1.6. ЕСКД. Общие правила выполнения чертежей (с изменениями) М.: Издательство стандартов, М.: 1991. - 236 с.

3.1.7. ЕСКД. Правила выполнения чертежей различных изделий (с изменениями), М.: Издательство стандартов, 1982. - 223 с.

3.1.8. ЕСКД. Правила выполнения схем. – М.: Изд-во стандартов, 1987. – 135 с.

3.2. Additional literature

3.2.1. *Богданов В. М.* Інженерна графіка: довідник / В. М. Богданов, А. П. Верхола, Б. Д. Коваленко та ін.; за ред. А. П. Верхоли. - К.: Техніка, 2001. – 268 с.

3.2.2. *Макаров В.І.* Нарисна геометрія. Інженерна та комп'ютерна графіка: навч. посіб. / В.І. Макаров, В.Г. Шевченко, М.Г. Макаренко та ін. – К.: Книжкове вид-во НАУ, 2006, – 259 с.

3.2.3. *Ковальов Ю.М.* Прикладна геометрія: підручник / Ю. М. Ковальов, В.М. Верещага. – К.: ДІА, 2012. – 472 с.



03.02 – 04)

АРКУШ РЕЄСТРАЦІ РЕВІЗІЇ

№ пор.	Прізвище ім'я по-батькові	Дата ревізії	Підпис	Висновок щодо адекватності

(Ф 03.02 – 03)

АРКУШ ОБЛІКУ ЗМІН

№ зміни	№ листа (сторінки)				Підпис особи, яка внесла	Дата внесення зміни	Дата введення зміни
	Зміненого	Заміненого	Нового	Анульованого			

(Ф 03.02 – 32)

УЗГОДЖЕННЯ ЗМІН

	Підпис	Ініціали, прізвище	Посада	Дата
Розробник				
Узгоджено				
Узгоджено				
Узгоджено				