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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SYLLABUS
on
«**Engineering and Computer Graphics**»

Field of Study: 13 «Mechanical Engineering»
Speciality: 134 «Aviation and Space Rocket Technology»
Specializations: «Airplanes and Helicopters»
            «Aircraft Equipment»

Year of Study – 1st   Semester – 2nd

Classroom Sessions	– 68	Graded Test	– 2nd semester
Self-study	– 82		
Total (hours/ECTS credits)	– 150/5,0		

Index CB -1-134/16-2.1.9

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The Syllabus on "Engineering and Computer Graphics" is based on the educational and professional program and Bachelor Curriculum № CB -1-134/16 for Speciality 134 «Aviation and Space Rocket Technology» and Specializations: «Airplanes and Helicopters», «Aircraft Equipment» and correspondent normative documents.

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Discussed and approved by the Graduate Department for the Speciality 134 «Aviation and Space Rocket Technology» and Specialization «Aircraft Equipment» – Aircraft Design Department, Minutes № ___ of «___»_____2016.
Head of the Department   _____ S. Ignatovych

Discussed and approved by the Graduate Department for the Speciality 134 «Aviation and Space Rocket Technology» and Specialization «Airplanes and Helicopters» – Hydraulic & Gaseous Systems Department, Minutes № ___ of «___»_____2016.
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Discussed and approved by the Scientific-Methodological-Editorial Board of the Educational and Research Institute of Airports, Minutes №_____ of «_____»_____2016.
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"_____"_____2016.   "_____"_____2016.

Document level – 3b
The planned term between the revisions – 1 year
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1. EXPLANATORY NOTES

The syllabus on «Engineering and Computer 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/роз.

This education discipline is the theoretical and practical basis of combination knowledge and skills that form the profile of a specialist in designing aviation and rocketry.

The purpose of teaching of discipline is to disclosure modern scientific concepts, notions and methods of display geometrical properties of technical objects in the form of technical design documents in accordance with the requirements of international, national and departmental standards.

The tasks of the study education discipline are:
- mastering of the theoretical basis of imaging techniques spatial forms on the plane;
- development of imaginary skills of reproduction space forms by its plane images;
- mastering of the basic rules and norms of design and execution drawings and other design documents established by international standards ЄСКД.
- mastering the basics of automated execution of graphic documentation using software packages.

As a result of study of educational discipline a student must:

To know:
- graphic methods of solving problems of geometric construction, that mainly lie in the definition of the shape, size and relative position of objects on the drawing;
- requirements of international, national and departmental standards for registration of design documents;
- functional abilities of widespread software products for developing design documents.
To be able:
- independently perform the following design documents - detail drawings, specifications, assembly drawings, circuit, an explanatory note using drawing tools and a personal computer with graphics and text software products;
- 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 editional discipline, learning of which provides for Module test and analysis of its implementation.

Educational discipline "Engineering and Computer graphics" based on knowledge of such disciplines as: "Descriptive Geometry", "Higher Mathematics" and there is a base to study educational disciplines "Designing of Machines and Mechanisms and Fundamentals of Interchangeability" and "Computer Technology in Engineering Calculations and 3D Modeling".

2. SUBJECT CONTENT

2.1. Module №1 «Projection bases of images».
Topic 2.1.1. Introduction. Types of products. Types and completeness of design documentation. Basic rules of design engineering documentation.

Systems standardization. Unified design documentation (ЄСКД). Definition of the product. The structure kinds products: details, assembly units, complex, set in accordance with ГОСТ 2.101-68.

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

The main rules of design drawings in accordance with interstate standards - formats (ГОСТ 2.301 - 68), scales (ГОСТ 2.302 - 68), lines (ГОСТ 2.303 - 68), fonts of drawing (ГОСТ 2.304 – 81), the basic inscriptions (ДСТУ ГОСТ 2.104:2006), put of sizes (ГОСТ 2.307 – 68).

Topic 2.1.2. Projection bases of images.

The main provisions of the imaging in accordance with ГОСТ 2.305 - 68. Determination of the view. Basic, advanced and local views. Determination of section, conditional symbol of materials in sections and cross-sections in accordance with ГОСТ 2.306 - 68. Simple and complex sections. Rules of the combination of the part of view and part of section. Ascenders. Definitions of cross-section. Removed, revolved cross-sections, sections in rupture of the main image. Conventions and simplify the performance of images. Execution drawings of technical forms.

Topic 2.1.3. Application Packages of interactive graphics. Graphic editor AutoCAD.

Definition of computer graphics (CG) in accordance with ГОСТ 2939 - 94. Areas of application CG and the main tasks. CG Technical means of CG: electronic computers, input devices and display devices of this exchange, the output device. Software of CG. Characteristics of software products for engineering: КОМПАС, AutoCAD, Solid Works.

The system AutoCAD: general information, appointment of system, user interface, commands of building and editing of geometric "primitives", put of sizes.

2.2. Module №2 «Development of working design documentation»
Topic 2.2.1. Drawings details.

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.

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

 Implementation of the drawing of details using a full-scale examples.

Topic 2.2.2. Types of connections of parts of the product. Their images and symbols.
Methods detachable parts and all-in-one connections with each other.

Classification detachable joints for structural features (thread, key, spline, pin, articulation). Formation of thread, their classification, basic parameters, simplified representation of thread in accordance with ГОСТ 2.311 - 68. Designation of standard fasteners threads. Standard fasteners threads for general engineering and use the standards for 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.

Terms of execution drawings of some all-in-one connections details: rivets, welding in accordance with the requirements of ГОСТ 2.312 - 68, soldering and gluing in accordance with the requirements ГОСТ 2.313 - 68.

Execution of drawings of threaded connections at baseline.

Topic 2.2.3. Drawings detailing the general form assembly units.

The rules of reading and analysis of the general view drawings drafting 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 drafting unit.

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

Topic 2.2.4. The working design documentation for assembly units.

Requirements for specification of assembling units in accordance with ГОСТ 2.106 – 96. Rules of filling of graph and lines of specification. Requirements for the assembly drawings of assembly unit in accordance with ГОСТ 2.109 - 73. Choice the minimal but sufficient number of images, application of sizes, recording of technical requirements . Conventions and simplification in assembly drawings. The execution sequence of assembly drawings which based on sketches of components of the product. Features performance of assembly drawing among graphic editor AutoCAD.

Development of specifications and assembly drawings using the drawings of parts of field assembly unit.

Topic 2.2.5. Scheme.

Definition of scheme in accordance with ДСТУ 3321:2003.

General requirements for schemes according to ГОСТ 2.701-84. Kinds and types of schemes. Rules of implementation of hydraulic and pneumatic schemes according to ГОСТ 2.704 – 76.

Development of principle hydraulic or pneumatic scheme of system of aircraft among the graphic editor AutoCAD.

3.LIST OF REFERENCES

3.1. Basic literature

3.1.1. *Михайленко В .Є.* Інженерна та комп'ютерна графіка: підручник / В. Є.Михайленко, В. М. Найдиш, А. М. Підкоритов, І. В. Скидан; за ред. В. Є.Михайленка. – К.: Вища шк. 2004. –342с.

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

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

3.1.5. ЕСКД. Основные положения (с изменениями) —М.: Издательство стандартов, 1975. – 350 с.

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.: ДІЯ, 2012. – 472 с.

(Ф 03.02 – 01)

АРКУШ ПОШИРЕННЯ ДОКУМЕНТА

№ прим.	Куди передано (підрозділ)	Дата видачі	П.І.Б. отримувача	Підпис отримувача	Примітки

(Ф 03.02 – 02)

АРКУШ ОЗНАЙОМЛЕННЯ З ДОКУМЕНТОМ

№ пор.	Прізвище ім'я по-батькові	Підпис ознайомленої особи	Дата ознайом-лення	Примітки

03.02 – 04)

АРКУШ РЕЄСТРАЦІЇ РЕВІЗІЇ

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

(Ф 03.02 – 03)

АРКУШ ОБЛІКУ ЗМІН

№ змі-ни	№ листа (сторінки)				Підпис особи, яка внесла	Дата внесен-ня зміни	Дата введен-ня зміни
	Зміненого	Заміненого	Нового	Анульо-ваного			

(Ф 03.02 – 32)

УЗГОДЖЕННЯ ЗМІН

	Підпис	Ініціали, прізвище	Посада	Дата
Розробник				
Узгоджено				
Узгоджено				
Узгоджено				