



# ENGINEERING AND COMPUTER GRAPHICS - 2

## Working program of the academic discipline (Syllabus)

### Details of the academic discipline

<b>Level of higher education</b>	<i>First (undergraduate)</i>
<b>Branch of knowledge</b>	<i>17. Electronics and telecommunications</i>
<b>Specialty</b>	<i>171. Electronics</i>
<b>Educational program</b>	<i>171. Acoustic electronic systems and acoustic information processing technologies 171. Electronic components and systems 171. Electronic devices and devices 171. Electronic multimedia systems and Internet</i>
<b>Discipline status</b>	<i>Normative</i>
<b>Form of education</b>	<i>full-time (day)/distance/mixed</i>
<b>Year of training, semester</b>	<i>1st year, autumn / spring semester</i>
<b>Scope of the discipline</b>	<i>6 (180)</i>
<b>Semester control/ control measures</b>	<i>Autumn semester - assessment, spring - exam</i>
<b>Lessons schedule</b>	<i>Autumn semester: lecture – once every two weeks (18 hours); practical classes - once every two weeks (18 hours). Spring semester: lecture – once every two weeks (18 hours); practical classes - once every two weeks (18 hours); computer workshop - once every two weeks (18 hours).</i>
<b>Language of teaching</b>	<i>Ukrainian</i>
<b>Information about head of the course / teachers</b>	<i>Department of descriptive geometry, engineering and computer graphics (building 7, room 815), e-mail: <a href="http://geometry.kpi.ua/">http://geometry.kpi.ua/</a> Phone:+380 44 204 94 46 Lecturer: Ph.D., associate professor, Tetyana Vitaliyivna Hnitetska, <a href="mailto:gnitetsk@ukr.net">gnitetsk@ukr.net</a>, 066 735 75 41<sup>1</sup> Practical classes: Ph.D. of Pedagogy, associate professor, Hnitetska Halyna Omelyanivna, <a href="mailto:gnitetsk@ukr.net">gnitetsk@ukr.net</a>, 050 710 41 87<sup>2</sup> Computer workshop: Ph.D., associate professor, Tetyana Vitaliyivna Hnitetska, <a href="mailto:gnitetsk@ukr.net">gnitetsk@ukr.net</a>, 066 735 75 41<sup>3</sup></i>
<b>Placement of the course</b>	<a href="https://do.ipk.kpi.ua/course/view.php?id=3362">https://do.ipk.kpi.ua/course/view.php?id=3362</a>

### Program of educational discipline

#### 1. Description of the educational discipline, its purpose, subject of study and learning outcomes

*The main goal of teaching the discipline "Engineering and computer graphics" is the formation of students' competences in the system of basic knowledge from the main sections of the course, gaining work experience and applying methods of geometric modeling of spatial forms, creating and designing design documentation using CAD AutoCAD with the application of requirements standards.*

The syllabus is structured in such a way that to complete each subsequent task, students need to apply the skills and knowledge acquired in the previous one. Special attention is paid to the principle of encouraging students to study actively. This is facilitated by the organization of independent work of students with the help of sets of methodical materials presented on the Sikorsky distance learning platform, including video lessons that are effective in the organization of distance learning. At the same time, students must perform practical tasks that will allow them to solve real tasks in their professional activities in the future. During training, the following are used:

- active and collective learning strategies;
- personality-oriented developing technologies based on active forms and methods of learning (team-based learning, independent work and independent study of individual topics of the discipline).

As a result of studying the "Engineering and computer graphics" discipline, students acquire the following competencies:

**загальні:**

1. ability to apply knowledge in practical situations (3K 1);
2. knowledge and understanding of the subject area and understanding of professional activity (3K 2)
3. the ability to communicate in the national language both orally and in writing (3K 3);
4. the ability to learn and master modern knowledge (3K 6);
5. the ability to realize one's rights and responsibilities as a member of society, to be aware of the values of a civil (free democratic) society and the need for its sustainable development, the rule of law, the rights and freedoms of a person and a citizen in Ukraine (3K 13);
6. the ability to preserve and multiply the moral, cultural, scientific values and achievements of society based on an understanding of the history and patterns of development of the subject area, its place in the general system of knowledge about nature and society and in the development of society, technology and technology, to use various types of motor activity for active recreation and leading a healthy lifestyle (3K 14).

**professionals:**

1. the ability to use knowledge and understanding of scientific facts, concepts, theories, principles and methods for the design and application of electronics devices, devices and systems (CK1);
2. the ability to perform analysis of the subject area and regulatory documentation. Necessary for the design and application of electronics devices, devices and systems (CK2);
3. the ability to apply appropriate mathematical, scientific and technical methods, modern information technologies and computer software. Skills of working with computer networks, databases and Internet resources for solving engineering problems in the field of electronics (CK5);
4. the ability to apply creative and innovative potential in the synthesis of engineering solutions and in the development of structures of electronic devices and systems (CK7);
5. the ability to apply industry standards and quality standards for the functioning of electronic devices and systems in practice (CK10).

**program learning outcomes:**

1. use documentation related to professional activities, using modern technologies and office equipment, use the English language, including special terminology for communicating with specialists, conducting literature searches and reading texts on technical and professional topics (P12);
2. be able to learn new knowledge, progressive technologies and innovations, find new unconventional solutions and means of their implementation, meet the requirements of flexibility in overcoming obstacles and achieving the goal, rational use and rationing of time, discipline, responsibility for one's decisions and activities (P13);
3. adhere to the norms of modern Ukrainian business and professional language (P14);

4. to demonstrate the skills of independent and collective work, leadership qualities. To organize work under conditions of limited time with an emphasis on professional integrity (P15). The above-mentioned competences and program learning outcomes of the discipline "Engineering and computer graphics" are ensured thanks to the knowledge of students:

- basics of descriptive geometry;
- basics of geometric modeling;
- trends in the development of modern information technologies;
- universal automated design system AutoCAD;
- methods of development of design and construction documentation according to the requirements of the standards.

## **2. Pre-requisites and post-requisites of the discipline (place in the structural and logical scheme of training according to the relevant educational)**

The discipline lays the foundations for studying other disciplines: informational basics of electronics; fundamentals of design in electronics; computer science; measurement techniques; analytical geometry; higher mathematics; technologies of virtual devices; course and diploma design, etc., as well as from disciplines that involve the ability to create and design traditional projection and electronic drawings of products with the help of modern CAD, geometric and computer 3d modeling of electronic equipment objects from the cycle of disciplines of professional and practical training of students, who study in senior courses.

## **3. Зміст навчальної дисципліни «Інженерна та комп'ютерна графіка. Комп'ютерна інженерна графіка»**

### **Chapter 5. General requirements of the standards for design documentation**

#### **Part 1. The system of standards for design documentation.**

Topic 5.1. Substantive provisions. Types of design documentation. Formats and basic inscriptions. Scales of the Line. Fonts. Basic requirements for drawing dimensions on drawings. Conjugation of geometric elements.

#### **Part 2. Application of the AutoCAD graphic editor for design documentation**

Topic 5.2. Purpose of the graphic editor AutoCad and its capabilities. Graphical editor interface. Basic commands for building graphic primitives and their editing. Model space. Letter space. Methods of specifying coordinates in AutoCAD. Object bindings. Image management.

Topic 5.3. Setting properties of objects. Creating layers. Setting text, dimension styles, units of measurement. Specifying blocks with attributes. Creation of A3 and A4 format templates using blocks with attributes.

Topic 5.4. Execution of conjugations in the graphic editor. Creation of arrays of objects. Construction of flat parts of a complex configuration using conjugations on an A3 format template. Drafting in accordance with the requirements of the standards. Output of drawings for printing.

### **Chapter 6. Modeling of 3D objects, construction of projection drawings in AutoCAD.**

#### **Part 1. Construction of images of objects on projection drawings. Axonometric projection.**

Topic 6.1. Images: views, sections, sections. Cuts are simple and complex. The method of applying dimensions taking into account the geometry of the part.

Topic 6.2. Axonometry. Methods of constructing axonometric images. Standard types of axonometry.

#### **Part 2. Modeling 3-d objects in AutoCAD.**

Topic 6.3. Use of basic geometric shapes. Methods of push-out, rotation, shift, loft. Application of user coordinate system. Use of logical operations. Commands for editing 3D objects.

Topic 6.4. Layout of projection drawing images in AutoCAD. Construction of the drawing "Simple sections" based on a previously created 3D model. The model is made according to a wooden model or an axonometric image of the object. Drafting of details in accordance with the requirements of the standards.

Topic 6.5. Construction of the drawing "Sections are complex" based on a previously created 3D model. The model is made according to the projection drawing of the part, which shows the types of the part. Drafting of details in accordance with the requirements of the standards

## **Chapter 7. Parameterization.**

Topic 7.1. Use of parameterization capabilities in geometric modeling. Imposition of geometric and dimensional dependencies. Settings Manager. Construction of a parametrized flat contour drawing.

## **Chapter 8. Sketches and working drawings of details.**

### **Part 1. Requirements of standards for the execution of working drawings and sketches of details.**

Topic 8.1. Features of the images of details on the drawing depending on the method of their production. Applying dimensions from technological bases. Cleanliness of surfaces. Signs of surface roughness. Specifications. The structure of the recording of the material.

Topic 8.2. Incision. Classification of the thread. Thread parameters. Thread grooves. The image of the thread on the working drawing of the part. Designation of the thread.

Topic 8.3. Peculiarities of execution of blueprints of parts made by turning. Sketches of "Shaft" and "Sleeve" type details.

### **Part 2. Application of parameterization as a means of solving problems of 3D computer geometric modeling of technical objects in AutoCAD.**

Topic 8.4. Construction of a 3D model of a part with a "Cap nut" thread using AutoCAD tools with the use of parameterization. Using the created 3D model to build a working drawing of the part and in accordance with current standards.

Topic 8.5. Construction of a 3D model of a part performed by turning. Execution of the working drawing of the "Shaft" part in the AutoCAD graphic editor environment by creating its 3D model using parameterization and in accordance with current standards.

## **Chapter 9. Assembly drawing.**

### **Part 1. Drawing up blueprints of folding units.**

Topic 9.1. Contents of assembly drawing. Standards requirements for creating assembly drawings. Conventions and simplifications on drawings of assembly units. Features of execution of assembly drawings of reinforced, soldered and welded products. Specification.

Topic 9.2. Threaded connections. The image of threaded connections on the assembly drawing. Calculation of simplified images of fasteners in joints.

Topic 9.3. Integral connections (soldering, gluing, welding). Methods of welding. Image and designation of seams of non-separable joints. Use of conventional signs. Specifications.

### **Part 2. Application of parameterization and dynamic blocks when creating drawings of folding units in AutoCAD.**

Topic 9.4. Creation of electronic image libraries of fasteners using dynamic blocks of the AutoCAD graphic editor.

Topic 9.5. Execution of the assembly drawing of the parameterized model of the assembly unit using the electronic library of images of fasteners created using dynamic blocks. Specification.

Topic 9.6. Execution of the assembly drawing using the created 3D model of the assembly unit, the individual parts of which are connected by soldering, gluing and welding. Specification.

## Section 10. Detailing.

### Part 1. Draftsman of a general view.

Topic 10.1. Appointment of a draftsman of a general type. Requirements for the draftsman of the general type of folding unit. Conventions and simplification. Detailing of the blueprint of the general view. Features of execution of working drawings of parts made by various technological operations.

### Part 2. Detailing in the AutoCAD graphic editor environment.

Topic. 10.2. Analysis of the blueprint of the general view and the selected detail. Creating a 3D model of the part. Execution of the working drawing of the part according to the pre-built 3D model.

## Section 11. Schemes.

### Part 1. Basic electrical scheme.

Topic 11.1. Types and types of schemes. The electrical scheme is basic. Conventional graphic symbols of scheme elements. Letter code of the element. Characteristics of input and output circles. Drawing up a list of elements.

### Part 2. Electronic diagram of the electrical principle scheme.

Topic 11.2. Construction of the electrical schematic diagram in the graphic editor AutoCAD using the created library of blocks with attributes. Execution of the list of elements.

## Chapter 12. Additional features of AutoCAD.

Topic 12.1. Interaction with other graphic editors (SolidWorks, 3D Max Studio, etc.): export-import of files with other formats.

## 4. Educational materials and resources

### *Basic literature*

1. Ванін В.В, Перевертун В.В, Надкернична Т.М. та ін. Інженерна та комп'ютерна графіка. К.: Вид.гр.ВНУ, 2009. — 400 с.
  2. Ванін В.В.,Блюк А.В.,Гнітецька Г.О. Оформлення конструкторської документації: Навч. посіб. 3-є вид.- К.: Каравела, 2012.-200 с.  
[http://geometry.kpi.ua/files/Vanin\\_Gniteckaja\\_kd1\\_2.pdf](http://geometry.kpi.ua/files/Vanin_Gniteckaja_kd1_2.pdf)
  3. Інженерна графіка: підручник для студентів вищих закладів освіти I - II рівнів акредитації/ В.Є.Михайленко, В.В.Ванін, С.М.Ковальов; За ред. В.Є.Михайленка. -Львів: Піча Ю.В.; К.: Каравела; Львів: Новий світ - 2000. - 284.
- ### *Додаткова література*
- 5 Михайленко В.Є., Ванін В.В., Ковальов С.М. Інженерна та комп'ютерна графіка. — К.: Каравела, 2012. — 363 с.
  - 6 Хаскін А.М. Креслення. — К.: Вища шк., 1985. — 440 с.

All the mentioned literature is available in sufficient quantity in the library of NTUU "KPI".

### *Information resource*

- 7 Complex of methodical materials. Educational platform of distance learning "Sikorsky":<https://do.ipk.kpi.ua/course/view.php?id=3362> .
- 8 7 Complex of methodical materials. Educational platform of distance learning "Sikorsky":<https://do.ipk.kpi.ua/course/view.php?id=3189> .
- 9 Library <ftp://77.47.180.135/>.

- 10 Methodical documentation of the website of the department page [Навчальна та методична література](http://ng-kg.kpi.ua/index.php?option=com_content&view=article&id=37:2010-06-05-04-40-02&catid=71:narisnauch1&Itemid=13): [http://ng-kg.kpi.ua/index.php?option=com\\_content&view=article&id=37:2010-06-05-04-40-02&catid=71:narisnauch1&Itemid=13](http://ng-kg.kpi.ua/index.php?option=com_content&view=article&id=37:2010-06-05-04-40-02&catid=71:narisnauch1&Itemid=13)

## Educational content

### 5. Methods of mastering an educational discipline (educational component)

The program of the academic discipline in the second semester provides for lectures, practical classes and a computer workshop. Methodical support for studying the course is the use of an information resource that presents a methodological complex of materials: a lecture course with reference to the relevant sections of the textbook co-authored by the lecturer; video lessons, options for tasks on course topics and methodological instructions for their implementation, posted on the "Sikorsky" Learning Platform. In the case of distance education, all these materials can be used for lectures, practical classes, and computer workshops on the Zoom platform, etc., and also be available when organizing independent work of students within the framework of remote access to information resources in a convenient for their time. All work in practical classes on engineering graphics is carried out in the premises of the department in special classes, equipped with sets of methodological documentation on paper media, tasks, atlases of draftsmen of general types, sets of models, parts and assembly units, etc.

### Lecture classes

10	<p><i>Lecture 10.</i> System of standards. Types of design documentation. Formats and basic inscriptions. Scales of the Line. Fonts. Basic requirements for drawing dimensions on drawings. Conjugation of geometric elements.</p> <p><b>Didactic tools:</b> <a href="https://do.ipk.kpi.ua/course/view.php?id=3362">https://do.ipk.kpi.ua/course/view.php?id=3362</a>; <a href="https://do.ipk.kpi.ua/course/view.php?id=3189">https://do.ipk.kpi.ua/course/view.php?id=3189</a>;</p> <p><b>Recommended Books:</b> [2].</p> <p><b>IWS:</b> Processing of lecture materials.</p>
11	<p><i>Lecture 11.</i> Images: views, sections, sections. The cuts are simple. Cuts are complicated. Applying dimensions.</p> <p><b>Didactic tools:</b> <a href="https://do.ipk.kpi.ua/course/view.php?id=3362">https://do.ipk.kpi.ua/course/view.php?id=3362</a>; <a href="https://do.ipk.kpi.ua/course/view.php?id=3189">https://do.ipk.kpi.ua/course/view.php?id=3189</a>;</p> <p><b>Recommended Books:</b> [2]</p> <p><b>IWS:</b> Processing of lecture materials.</p>
12	<p><i>Lecture 10.</i> Axonometric projection method. Apparatus for axonometric projection. Rectangular and oblique axonometry. Distortion indicators. Types of axonometry regulated by the standard. Examples of detail construction in orthogonal isometry and dimetry.</p> <p><b>Didactic tools:</b> <a href="https://do.ipk.kpi.ua/course/view.php?id=3362">https://do.ipk.kpi.ua/course/view.php?id=3362</a>; <a href="https://do.ipk.kpi.ua/course/view.php?id=3189">https://do.ipk.kpi.ua/course/view.php?id=3189</a>;</p> <p><b>Recommended Books:</b> [6].</p> <p><b>IWS:</b> Processing of lecture materials</p>
13	<p><i>Lecture 13.</i> Parameterization. Use of parameterization capabilities in AutoCAD in geometric modeling. Imposition of geometric and dimensional dependencies. Settings Manager. Construction of a parametrized flat contour drawing.</p> <p><b>Didactic tools:</b> <a href="https://do.ipk.kpi.ua/course/view.php?id=3362">https://do.ipk.kpi.ua/course/view.php?id=3362</a>; <a href="https://do.ipk.kpi.ua/course/view.php?id=3189">https://do.ipk.kpi.ua/course/view.php?id=3189</a>;</p>

	<i>IWS: Processing of lecture materials. Preparation for modular control work.</i>
14	<p><u>Lecture 14.</u> Working drawings and sketches of details. Requirements for working drawings of details. Features of the images of details on the drawing depending on the method of their production. Incision. Classification of the thread. Thread parameters. Thread grooves. The image of the thread on the working drawing of the part. Designation of the thread. Peculiarities of execution of blueprints of parts made by turning. Details of the type "Shaft" and "Sleeve". Peculiarities of execution of the "Shaft" working drawing. The main elements of the shaft. Key grooves. Applying dimensions from technological bases. Signs of surface roughness. Specifications. The structure of the recording of the material.</p> <p><b>Didactic tools:</b> <a href="https://do.ipk.kpi.ua/course/view.php?id=3362">https://do.ipk.kpi.ua/course/view.php?id=3362</a>; <a href="https://do.ipk.kpi.ua/course/view.php?id=3189">https://do.ipk.kpi.ua/course/view.php?id=3189</a>;</p> <p><b>Recommended Books:</b> [2].</p> <p><i>IWS: Processing of lecture materials.</i></p>
15	<p><u>Lecture 15.</u> Folding drawing board.</p> <p>Contents of assembly drawing. Standards requirements for assembly drawings. Conventions and simplifications on drawings of assembly units. Threaded connections. The image of threaded connections on the assembly drawing. Calculation of simplified images of fasteners in joints. Specification.</p> <p><b>Didactic tools:</b> <a href="https://do.ipk.kpi.ua/course/view.php?id=3362">https://do.ipk.kpi.ua/course/view.php?id=3362</a>; <a href="https://do.ipk.kpi.ua/course/view.php?id=3189">https://do.ipk.kpi.ua/course/view.php?id=3189</a>;</p> <p><b>Recommended Books:</b> [2].</p> <p><i>IWS: Processing of lecture materials.</i></p>
16	<p><u>Lecture 16.</u> Folding drawing board. Features of execution of assembly drawings of reinforced, soldered and welded products</p> <p>Integral connections (soldering, gluing, welding). Methods of welding. Image and designation of seams of non-separable joints. Use of conventional signs. Specifications.</p> <p><b>Didactic tools:</b> <a href="https://do.ipk.kpi.ua/course/view.php?id=3362">https://do.ipk.kpi.ua/course/view.php?id=3362</a>; <a href="https://do.ipk.kpi.ua/course/view.php?id=3189">https://do.ipk.kpi.ua/course/view.php?id=3189</a>;</p> <p><b>Recommended Books:</b> [2].</p> <p><i>IWS: Processing of lecture materials.</i></p>
17	<p><u>Lecture 17.</u> Draftsman of general view.</p> <p>Completeness of design documentation. Appointment of a draftsman of a general type. Requirements for the draftsman of the general type of folding unit. Conventions and simplification. Detailing of the blueprint of the general view. Working drawings of parts made by various technological operations.</p> <p><b>Didactic tools:</b> <a href="https://do.ipk.kpi.ua/course/view.php?id=3362">https://do.ipk.kpi.ua/course/view.php?id=3362</a>; <a href="https://do.ipk.kpi.ua/course/view.php?id=3189">https://do.ipk.kpi.ua/course/view.php?id=3189</a>;</p> <p><b>Recommended Books:</b> [2].</p> <p><i>IWS: Processing of lecture materials.</i></p>
18	<p><u>Lecture 18.</u> Basic electrical circuits.</p> <p>Types and types of schemes. Conventional graphic symbols of the elements of the electrical principle scheme. Letter code of the element. Characteristics of input and output circles. Drawing up a list of elements.</p> <p><b>Didactic tools:</b> <a href="https://do.ipk.kpi.ua/course/view.php?id=3362">https://do.ipk.kpi.ua/course/view.php?id=3362</a>; <a href="https://do.ipk.kpi.ua/course/view.php?id=3189">https://do.ipk.kpi.ua/course/view.php?id=3189</a>;</p>

	<p><b>Recommended Books:</b> [2,].</p> <p><b>IWS:</b> Processing of lecture materials.</p>
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## Practical training

№ 3/II	Name of the subject of the lesson and list of main questions (list of didactic support, references to literature and tasks for students' independent work)
10	<p><u>Practical lesson 10.</u> Images: views, sections, cross-sections. The cuts are simple. Applying dimensions. Making a sketch of a projection drawing of a wooden model using simple sections. Checking a drawing of a flat part of a complex configuration made by AutoCAD tools.</p> <p><b>Didactic tools:</b> <a href="https://do.ipk.kpi.ua/course/view.php?id=3362">https://do.ipk.kpi.ua/course/view.php?id=3362</a>; <a href="https://do.ipk.kpi.ua/course/view.php?id=3189">https://do.ipk.kpi.ua/course/view.php?id=3189</a>; reference tables, methodological maps, wooden models.</p> <p><b>Recommended Books:</b> [2].</p> <p><b>IWS:</b> Refinement of the sketch of the projection drawing of the wooden model using simple sections. (A3).</p>
11	<p><u>Practical lesson 11.</u> Image: views, sections, cross-sections. Cuts are complicated. Applying dimensions. Making a sketch of a part with a complex section according to the given two views. Checking the projection drawing "Sections are simple" made by means of AutoCAD.</p> <p><b>Didactic tools:</b> <a href="https://do.ipk.kpi.ua/course/view.php?id=3362">https://do.ipk.kpi.ua/course/view.php?id=3362</a>; <a href="https://do.ipk.kpi.ua/course/view.php?id=3189">https://do.ipk.kpi.ua/course/view.php?id=3189</a>; reference tables, methodical maps, task variants (a projection diagram of a geometric model with an image of its types).</p> <p><b>Recommended Books:</b> [2].</p> <p><b>IWS:</b> Refinement of the sketch of the part with a complex section according to the given two (A3).</p>
12	<p><u>Modular control work.</u> Construction of a parameterized drawing of a flat part of a complex configuration using AutoCAD.</p> <p><b>Didactic tools:</b> <a href="https://do.ipk.kpi.ua/course/view.php?id=3362">https://do.ipk.kpi.ua/course/view.php?id=3362</a>; <a href="https://do.ipk.kpi.ua/course/view.php?id=3362">https://do.ipk.kpi.ua/course/view.php?id=3362</a>.</p> <p><b>IWS:</b> Elaboration of lecture material.</p>
13	<p><u>Practical lesson 13.</u> Working drawings and sketches of details.</p> <p>Incision. Image and designation of the thread on the drawing. Parameters of surface roughness of the part. Material. Execution of a sketch of a typical part with a thread (cap nut) in accordance with the requirements of current standards. Checking the projection drawing "Complex Sections" made by AutoCAD.</p> <p><b>Didactic tools:</b> <a href="https://do.ipk.kpi.ua/course/view.php?id=3362">https://do.ipk.kpi.ua/course/view.php?id=3362</a>; <a href="https://do.ipk.kpi.ua/course/view.php?id=3189">https://do.ipk.kpi.ua/course/view.php?id=3189</a>; reference tables, methodical maps, cut details.</p> <p><b>Recommended Books:</b> [2].</p> <p><b>IWS:</b> Refinement of the sketch of the part with a thread (A3).</p>
14	<p><u>Practical session 14.</u> Working drawings and sketches of details.</p> <p>Peculiarities of execution of blueprints of parts made by turning. Details of the type "Shaft" and "Sleeve". Applying dimensions from technological bases. Execution of the sketch of the "Shaft" detail in accordance with the requirements of current standards. Checking the working drawing "Cap nut" made by AutoCAD.</p> <p><b>Didactic tools:</b> <a href="https://do.ipk.kpi.ua/course/view.php?id=3362">https://do.ipk.kpi.ua/course/view.php?id=3362</a>; <a href="https://do.ipk.kpi.ua/course/view.php?id=3189">https://do.ipk.kpi.ua/course/view.php?id=3189</a>; reference tables, methodical maps, "Shaft" details.</p>



	<p><b>Recommended Books:</b> [2].</p> <p><b>IWS:</b> Completion of the sketch of the "Shaft" part (A3).</p>
15	<p><u>Practical lesson 15.</u> Assembly drawing. Specification. Threaded connections. Calculation of simplified images of fastening elements in connections by options. Checking the working drawing "Shaft" made by AutoCAD.</p> <p><b>Didactic tools:</b> <a href="https://do.ipk.kpi.ua/course/view.php?id=3362">https://do.ipk.kpi.ua/course/view.php?id=3362</a>; <a href="https://do.ipk.kpi.ua/course/view.php?id=3189">https://do.ipk.kpi.ua/course/view.php?id=3189</a>; reference tables, methodological maps, task maps.</p> <p><b>Recommended Books:</b> [2].</p> <p><b>IWS:</b> Performing calculations of simplified images of fastening elements of the assembly drawing "Threaded connections".</p>
16	<p><u>Practical lesson 16.</u> Assembly drawing. Conventions and simplifications on the assembly drawing. Connection by welding, brazing, gluing. Implementation of the specification. Inspection of the assembly drawing "Threaded connections" made by AutoCAD.</p> <p><b>Didactic tools:</b> <a href="https://do.ipk.kpi.ua/course/view.php?id=3362">https://do.ipk.kpi.ua/course/view.php?id=3362</a>; <a href="https://do.ipk.kpi.ua/course/view.php?id=3189">https://do.ipk.kpi.ua/course/view.php?id=3189</a>; reference tables, methodological maps, task maps.</p> <p><b>Recommended Books:</b> [2].</p> <p><b>IWS:</b> Execution of the assembly drawing "Connections are inseparable" and specifications (A3).</p>
17	<p><u>Practical lesson 17.</u> Detailing. Peculiarities of detailing the drawing of the general view of the folding unit. Making a sketch of the detail of the corresponding position on the drawing of the general view according to the device variant in the atlas. Checking the assembly drawing "Connections are inseparable" made by AutoCAD tools.</p> <p><b>Didactic tools:</b> <a href="https://do.ipk.kpi.ua/course/view.php?id=3362">https://do.ipk.kpi.ua/course/view.php?id=3362</a>; <a href="https://do.ipk.kpi.ua/course/view.php?id=3189">https://do.ipk.kpi.ua/course/view.php?id=3189</a>, atlases of folding units.</p> <p><b>Recommended Books:</b> [2].</p> <p><b>IWS:</b> Making a sketch of the part.</p>
18	<p><u>Practical lesson 18.</u> Schemes. Basic electrical diagrams. Execution of the schematic diagram of the electrical principle and the list of elements. Checking the assembly drawing "Connections are inseparable" made by AutoCAD tools. Verification of the working drawing of the part, made by means of AutoCAD.</p> <p><b>Didactic tools:</b> <a href="https://do.ipk.kpi.ua/course/view.php?id=3362">https://do.ipk.kpi.ua/course/view.php?id=3362</a>; <a href="https://do.ipk.kpi.ua/course/view.php?id=3189">https://do.ipk.kpi.ua/course/view.php?id=3189</a>.</p> <p><b>Recommended Books:</b> [2].</p> <p><b>IWS:</b> Implementation of conventional graphic markings of elements of electrical principle schemes in the AutoCAD graphic editor.</p>

### Computer workshop

№	The name of the computer workshop	Number classroom hours
1	<u>Computer workshop 1.</u> Graphical editor interface. Basic commands for building graphic primitives and their editing. Model space. Letter space. Methods of specifying coordinates in AutoCAD. Object bindings. Image management. Setting properties of objects. Creating layers. Setting text, dimension styles, units of measurement. Specifying blocks with attributes. Creation of A3 and A4	2

	<p>format templates using blocks with attributes. Conjugation Execution of graphic work "Flat contour".</p> <p><b>Recommended didactic tools for students' independent work</b>  <a href="https://do.ipokpi.ua/course/view.php?id=3362">https://do.ipokpi.ua/course/view.php?id=3362</a>.</p>	
2	<p><u>Computer workshop 2.</u> Use of basic geometric shapes. Methods of push-out, rotation, shift, loft. Application of user coordinate system. Use of logical operations. Layout of the draftsman according to the created 3D model. Execution of the drawing of the model of the part with simple sections according to the pre-created 3D model in accordance with the requirements of the standards.</p> <p><b>Recommended didactic tools for students' independent work:</b>  <a href="https://do.ipokpi.ua/course/view.php?id=3362">https://do.ipokpi.ua/course/view.php?id=3362</a></p>	2
3	<p><u>Computer workshop 3.</u> Algorithms for constructing complex sections in AutoCAD. Execution of the drawing of the model of the part with complex sections according to the pre-created 3D model in accordance with the requirements of the standards.</p> <p><b>Recommended didactic tools for students' independent work</b>  <a href="https://do.ipokpi.ua/course/view.php?id=3362">https://do.ipokpi.ua/course/view.php?id=3362</a></p>	2
4	<p><u>Computer workshop 4.</u> Using the possibilities of parameterization in geometric modeling. Imposition of geometric and dimensional dependencies. Settings Manager. Making a 3D model of a cap nut using parameterization. Layout of the draftsman according to the created 3D model. Drafting of details in accordance with the requirements of the standards.</p> <p><b>Recommended didactic tools for students' independent work:</b>  <a href="https://do.ipokpi.ua/course/view.php?id=3362">https://do.ipokpi.ua/course/view.php?id=3362</a></p>	2
5	<p><u>Computer workshop 5.</u> Algorithms for constructing sections in AutoCAD. Execution of a 3D model of a shaft detail using parameterization. Layout of the draftsman according to the created 3D model. Drafting of details in accordance with the requirements of the standards.</p> <p><b>Recommended didactic tools for students' independent work:</b>  <a href="https://do.ipokpi.ua/course/view.php?id=3362">https://do.ipokpi.ua/course/view.php?id=3362</a></p>	2
6	<p><u>Computer workshop 6.</u> Creation of electronic libraries of simplified images of fasteners made using dynamic blocks in the AutoCAD graphic editor environment.</p> <p>Execution of the assembly drawing of the model of the assembly unit with parameterization elements using the created electronic library of images of fasteners. Specification.</p> <p><b>Recommended didactic tools for students' independent work:</b>  <a href="https://do.ipokpi.ua/course/view.php?id=3362">https://do.ipokpi.ua/course/view.php?id=3362</a></p>	2
7	<p><u>Computer workshop 7.</u> Making an assembly drawing of a folding unit based on a pre-created 3D model, the individual parts of which are connected by soldering, gluing and welding. Specification.</p> <p><b>Recommended didactic tools for students' independent work:</b>  <a href="https://do.ipokpi.ua/course/view.php?id=3362">https://do.ipokpi.ua/course/view.php?id=3362</a></p>	2
8	<p><u>Computer workshop 8.</u> Detailing of a drawing of a general view. Execution of the working drawing of the part according to the previously created 3D model in accordance with the requirements of the current standards.</p>	2

	<b>Recommended didactic tools for students' independent work:</b> <a href="https://do.ipk.kpi.ua/course/view.php?id=3362">https://do.ipk.kpi.ua/course/view.php?id=3362</a>	
9	<b>Computer workshop 9.</b> Basic electrical circuits. Execution of the blueprint of the electrical principle scheme in accordance with the option. List of elements. Printing the drawing. Interaction with other graphic editors (SolidWorks, 3D Max Studio, etc.): export-import of files with other formats. <b>Recommended didactic tools for students' independent work:</b> <a href="https://do.ipk.kpi.ua/course/view.php?id=3362">https://do.ipk.kpi.ua/course/view.php?id=3362</a>	2

## 6. Independent work of a student/graduate student.

Hours assigned to the student's independent work are specified in clause 5. The method of mastering the academic discipline is the completion of homework, preparation for the performance of work in practical classes and a computer workshop; performance of calculation and graphic work, as well as preparation for the modular control work and exam.

### Policy and control

#### 7. Policy of academic discipline (educational component)

Studying the academic discipline "Engineering and computer graphics. "Computer engineering graphics" requires a higher education applicant to:

- observance of educational and academic ethics;
- compliance with the schedule of the educational process;
- be balanced, attentive in classes;
- systematically study theoretical material;
- compliance with the schedule of protection of graphic works, computer workshop, calculation and graphic work.

The applicant's answer must show signs of independent performance of the assigned task, absence of signs of repetition and plagiarism.

If the student of higher education was absent from the lecture, then he should practice this lecture at another time (with another group, at a consultation, on his own, using methodical materials presented on the Sikorsky distance learning platform, video recordings, etc.).

If the student of higher education was absent from a practical lesson or computer workshop, he should work through the material of this practical lesson or computer workshop at another time (with another group, at a consultation, independently, using methodical materials presented on the distance learning platform Sikorskyi, video recordings, etc.).

#### 8. Types of control and rating system for evaluating learning outcomes (ELO)

Current control: protection of graphic works and works of computer workshops, modular control work.

Calendar control: is conducted twice a semester as a monitoring of the current state of fulfillment of the syllabus requirements.

The condition of the first calendar control is to obtain at least 16 points, perform and defend two graphic works, two computer workshops and receive a positive evaluation from the modular control work. The condition of the second calendar control is to obtain at least 34 points, perform and defend four graphic works, four computer workshops, and perform modular and calculation-graphic work.

Conditions for admission to the final examination: admission of all graphic works, protection of all computer practicals, protection of computational and graphic work, positive evaluation of the modular control work.

The student's rating is calculated on a 100-point scale: 60 points for the current rating and 40 points for the exam grade.

1. The student's credit module rating consists of the points he receives for:

- performance and protection of graphic works (WG) (4 works);
- execution and defense of works from computer workshops (4 works);
- execution of modular control work;
- implementation and protection of graphic and calculation work (RGR).

## 2. Scoring criteria:

### 2.1. The execution and protection of graphic works is evaluated in 5 points:

- flawlessly executed work, excellent graphics - 5 points;
- there are certain shortcomings in the execution, good schedule, violation of the schedule of delivery up to 2-3 weeks - 3 points;
- there are significant shortcomings in execution, satisfactory graphics - 2 points;

### 2.2. Completion and defense of works from computer workshops are evaluated in 5 points:

- flawlessly executed work, excellent graphics - 5 points;
- there are certain shortcomings in the execution, good schedule, violation of the schedule of delivery up to 2-3 weeks - 3 points;
- there are significant shortcomings in execution, satisfactory graphics - 2 points;

### 2.3. Performance of modular control work is evaluated in 6 points:

- flawlessly executed work - 6 points;
- non-significant shortcomings in the performance of work - 4 points;
- significant shortcomings in the performance of work - 2 points;
- work performed incorrectly or not performed at all - 0 points.

### 2.4. Completion of calculation and graphic work is estimated at 14 points:

- flawlessly executed work - 14 points;
- there are not significant shortcomings in the performance of work - 12 points;
- there are significant shortcomings in the performance of work - 7 points;
- work performed incorrectly or not performed at all - 0 points

Table of correspondence of rating points to grades on the university scale:

<i>Scores</i>	<i>Rating</i>
100-95	Perfectly
94-85	Very good
84-75	Fine
74-65	Satisfactorily
64-60	Enough
Less than 60	Unsatisfactorily
Admission conditions not met	Not allowed

## 9. Additional information on the discipline (educational component)

Passing the exam takes place by tickets. The ticket consists of two complex tasks, the implementation of which requires the possession of educational material in both engineering and computer graphics and knowledge of the requirements of the standards regarding the design documentation.

### Working program of the academic discipline (syllabus):

**Compiled by:** Associate Professor of the Department of Graphic Geometry, Engineering and Computer Graphics, Ph.D. Hnitetska T.V.

**Approved by** the \_NGIKH\_ department (protocol No. \_5\_ dated 28.03.2023)

**Agreed by** the Methodical Commission of the Faculty of Electronics (protocol No. 06/2023 dated 06/29/2023)