

ENGINEERING AND COMPUTER GRAPHICS - 1

Working program of the academic discipline (Syllabus)

Details of the academic discipline

Level of higher education	<i>First (bachelor's degree)</i>
Branch of knowledge	<i>17. Electronics, automation and electronic communications.</i>
Specialty	<i>174. Automation, computer-integrated technologies and robotics.</i>
Educational program	<i>174. Computer-integrated systems and technologies in instrument engineering</i>
Discipline status	<i>selective</i>
Form of education	<i>intramural (day)</i>
Year of preparation, semester	<i>1 course, autumn</i>
Scope of the discipline	<i>4(120)</i>
Semester control/ control measures	<i>Fall semester - credit.</i>
Timetable	<i>According to the schedule https://schedule.kpi.ua/</i>
Language of teaching	<i>Ukrainian</i>
Information about course leader/teachers	<i>Department of descriptive geometry, engineering and computer graphics (building. 7, room 815), http://geometry.kpi.ua/ Phone number:+380 44 204 94 46 Lecturer: senior teacher, Galina Valentynivna Baskova, , +380683773820 Practical classes:senior teacher, Galina Valentynivna Baskova, , baskovagv31@gmail.com ,+380683773820; senior teacher, Nataliya Viktorivna Mikhlevska, natavikmih@gmail.com,+380676459765.</i>
Placement of the course	<i>https://do.ipk.kpi.ua/course/view.php?id=3352</i>

The program of the academic discipline

1. Description of the academic 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 of 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, which 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;*
- personal-oriented development 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 Graphics" discipline, students acquire the following competencies:

general:

- 1. ability to apply knowledge in practical situations (3K 01);*
- 2. the ability to search, process and analyze information from various sources (3K 05);*

3. *the ability to communicate in the state language both orally and in writing (3K 02);*
4. *ability to work in a team (3K 08);*
5. *the ability to realize one's rights and responsibilities as a member of society, to be aware of the values of 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 09);*
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 10).*

professional:

1. *the ability to use the latest technologies in the field of automation and computer-integrated technologies to solve professional tasks, in particular, the design of multi-level control systems, data collection and their archiving to form a database of process parameters and their visualization using human-machine interface tools (ΦK6);*
2. *the ability to design automation systems taking into account the requirements of relevant regulatory documents and international standards (ΦK8);*
3. *the ability to freely use modern computer and information technologies to solve professional tasks, to program and use applied and specialized computer-integrated environments to solve automation tasks (ΦK9);*
4. *the ability to take into account social, ecological, ethical, economic aspects, requirements of labor protection, industrial sanitation and fire safety during the formation of technical solutions (ΦK10);*
5. *the ability to design and construct elements of devices and devices of automated systems, the order of their installation, assembly, testing and control (ΦK12);*
6. *the ability to design and implement technological processes for the manufacture of instrument-making products of various purposes, which are used in automated production, with the selection of typical equipment, tools and equipment. to make changes and proposals in the design and technological documentation in order to improve the quality of products (ΦK13);*
7. *the ability to calculate, design and construct in accordance with the technical task of typical systems, devices, parts and assemblies at the schematic and elemental levels using computer design tools (ΦK14).*

learning outcomes:

1. *be able to perform work on the design of automation systems, know the content and rules of design of materials, the composition of design documentation and the sequence of execution of design works, taking into account the requirements of relevant regulatory documents and international standards (ΠPH11);*
2. *be able to use a variety of specialized software to solve typical engineering problems in the field of automation, in particular, mathematical modeling, automated design, database management, computer graphics methods (ΠPH12);*
3. *be able to take into account social, ecological, ethical, economic aspects, requirements of labor protection, industrial sanitation and fire safety during the formation of technical solutions. To be able to use different types and forms of motor activity for active recreation and leading a healthy lifestyle (ΠPH13);*
4. *to be able to use the fundamental concepts and categories of state-building in industrial and social activities to substantiate one's worldview positions and political beliefs, taking into account the processes of the socio-political history of Ukraine, legal foundations and ethical norms (ΠPH14);*
5. *to be able to design and implement technological processes for the manufacture of instrumentation products for various purposes, which are used in automated production, with the selection of typical equipment, tools and equipment, to make changes and suggestions in design and technological documentation in order to improve the quality of products (ΠPH15);*
6. *be able to calculate, design elements and mechanical units of devices and devices of automated systems (ΠPH16);*

7. be able to use computer design tools for calculation, design and construction, in accordance with the technical task, of typical systems, devices, parts and assemblies at the schematic and elemental levels (ПРН17).

The above-mentioned competences and program learning outcomes of the discipline "Engineering and computer graphics" are based on the knowledge of students:

- the basics of graphic geometry and engineering graphics;
- 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 program)

The discipline lays the foundations for studying other disciplines such as: applied mechanics; design of device elements; metrology; when studying disciplines by profession; cycle of professional training disciplines for students studying in senior courses; in course and diploma design

3. Content of the educational discipline "Engineering graphics". Fundamentals of geometric modeling. Types and rules of design of technical drawings.

Distribution of study time by types of classes and tasks from the credit module according to the working curriculum:

Semester	Learning time		Distribution of study hours			Control activities		
	credits	academic hours	Lectures	Practical	SWS	MKW	CGW	semester attestation
1	4	120	18	54	48	1	-	credit

Chapter 1. Representation of point, line, and plane models in the system of projection planes.

Topic 1.1. Projection methods: central and parallel. Orthogonal projection is the main method of construction of technical drawings. Specifying the position of the point model in the system of projection planes. Creation of a complex drawing point. Position of points in space relative to projection planes. Direct and inverse tasks (construction and reading of a projection drawing). Creation of additional systems of projection planes.

Topic 1.2. Representation of the straight line model in the system of projection planes. Specifying a straight line on the plot. Lines of a separate position: level and projecting. The line of general position. Traces of a straight line. Belonging to a point is a straight line. Determination of the natural value of the line segment of the general position and the angles of inclination to the projection planes by the method of replacing the projection planes and by the method of a right triangle. Division of the line segment in the given ratio. Modeling the mutual position of straight lines in space: parallelism, intersection, transience.

Topic 1.3. Representation of the plane model in the system of projection planes. Setting the plane on the drawing. Planes of a separate position: level and projecting. Trace-projection of the plane of a separate position. Planes of general position. Belonging to a line and a point in a plane. Determination of the natural size of a flat figure and the angles of inclination to the projection planes. Determination of the natural magnitude of a dihedral angle. Modeling the relative position of planes in space: parallelism, intersection (separate cases). Circle projection.

Chapter 2. Modeling of surfaces.

Topic 2.1. Curved lines and surfaces. Surface modeling methods. Determinants of surfaces. Expandable and non-expandable linear surfaces. Surfaces of rotation. Construction of points and lines on surfaces.

Chapter 3. Modeling the intersection of geometric elements.

Topic 3.1. Modeling the intersection of surfaces with a plane. General method of crossing surfaces with a plane. Four classes of problems. Construction of the line (figure) of the intersection of second-order surfaces by planes of individual and general position. Determination of the natural size of the cross-sectional figure. Sweeps.

Topic 3.2. Single penetration. General method of solving problems on the penetration of surfaces. The concept of a view and a simple section.

Topic 3.3. Intersection of surfaces. Method of mediators. Individual cases of intersection of second-order surfaces. The use of mediators - planes of a separate position. Method of spherical mediators. Monge's theorem. Conclusions from the theorem.

Chapter 4. Axonometric projections.

Chapter 5. Types and rules of design of technical drawings.

Topic 5.1. The system of ESCD standards - the main provisions. Formats. Scales. Lines. Fonts. Geometric drawing. Conjugation of geometric elements. Basic requirements for drawing dimensions on the drawing.

Topic 5.2. Projection drawing book DSTU2.104:2006. Main images. Types, sections, sections. Classification of sections. Simple cuts: horizontal, vertical, oblique. Complex cuts: stepped, broken and combined. Peculiarities of their implementation. The main provisions of the standard DSTU 3321-2003: Application of dimensions DSTU2.307:2013. Construction of three main views and simple sections according to the model.

Topic 5.3. Complex cuts. Construction of the third view according to the two given ones. Performing a complex cut.

Topic 5.4. Incision. Classification of the thread. Image and designation of the thread on the drawing. Detail with thread DSTU3321-2003, DSTU27148:2008. Cleanliness of the surface of the part. Surface roughness parameters. Conventions for marking roughness on drawings. Grooves for the exit of the threading tool.

Topic 5.5. Sketches and working drawings of details DSTU3321-2003. Designation of the material on the drawings. Execution of the drawing of the part with a cut according to the options.

Topic 5.6. Shaft Structural and technological elements. Features of the image and drawing of dimensions. Execution of the drawing of the detail "Shaft" according to the options.

Topic 5.7. Geared wheel. Structural and technological elements. Features of the image and drawing of dimensions. Execution of the sketch of the "Gear wheel" part from nature according to the options.

Topic 5.8. Structural elements of assembly units. Threaded connections. Constructive and simplified image of threaded connections with a bolt, screw, and pin. Performing calculations of fastening elements. Connections are inseparable. Specification for assembly drawing. Filling rules.

Topic 5.9. A sketch of a case detail from nature.

Topic 5.10. Applying the dimensions and roughness of the surfaces of the body part.

Topic 5.11. Sketch of a detail of the "Shaft" type from nature.

Topic 5.12. A sketch of a detail of the "Cover" type from nature.

Topic 5.13. Compilation of the specification of the assembly **unit**.

Topic 5.14. Assembly diagram of the node.

Topic 5.15. Detailing of the blueprint of the general view. A sketch of a part of the "Cover" type.

Topic 5.16. Detailing of the blueprint of the general view. Sketch of a detail of the "Shaft" type.

4. Educational materials and resources

Basic literature

1. 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.
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
3. Ванін В.В, Перевертун В.В, Надкернична Т.М. , Власюк Г.Г. Інженерна графіка. - К.: Видавнича група ВНУ, 2009. — 400 с.

Additional literature

4. Михайленко В.Є., Ванін В.В., Ковальов С.М. Інженерна та комп'ютерна графіка. — К.: Каравела, 2012. — 363 с.
5. Хаскін А.М. Креслення. — К.: Вища шк., 1985. — 440 с.
6. Хмеленко О.С.. Нарисна геометрія. Підручник. — К.: Кондор, 2008 р. — 440 с.
7. Колосова О.П., Баскова Г.В., Лазарчук М.В. «Навчальні завдання з нарисної геометрії, інженерної та комп'ютерної графіки для програмованого навчання». Навчальний посібник. Електронне мережне навчальне видання. — К.: «КПІ ім. Ігоря Сікорського», 2022 — 94 с.
<https://ela.kpi.ua/handle/123456789/48991>

All the mentioned literature is available in sufficient quantity in the library of KPI named after Igor Sikorsky

Information resource

8. A set of methodical materials. Educational platform of distance learning "Sikorsky":
<https://do.ipk.kpi.ua/course/view.php?id=3352>
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)

Educational content

1. Methods of mastering an educational discipline (educational component)

The program of the academic discipline provides lectures and practical classes. Methodical support for studying the course is the use of an information resource that presents a methodological set of materials: a lecture course with a step-by-step explanation of the educational material of individual course topics and the use of animation elements; video lessons; workbook, both in printed version and in the form of a website with an interactive step-by-step solution to homework and classroom tasks posted on the "Sikorsky" educational platform. In the case of distance learning, all these materials can be used for lectures and practical classes on the Zoom and other platforms, as well as be available when organizing students' independent work as part of remote access to information resources at a time convenient for them.

Lectures

№ з/П	Topics of lectures
1	<p>Projection methods. Central and parallel projection. Geometric modeling of spatial objects. Projection of a point on three mutually perpendicular planes. Complex point drawing. Methods of constructing the third projection of a point. Position of points relative to projection planes. Direct and inverse problems. Determination of the distance from a point to the planes and axes of the projections. Competing points. Creation of additional systems of projection planes.</p> <p>Didactic tools: https://do.ipk.kpi.ua/course/view.php?id=3352; workbook from the course [7].</p> <p>Recommended Books: [3], Chapter 1, pp. 12-18; Chapter 2, page 45; [6], ch. 1, p. 16-35, ch. 2, p. 151.</p> <p>ISW: Doing homework in the workbook on the given topic [7].</p>
2	<p>Straight line projection. Specifying a straight line on the plot. Lines of a special position: level and projecting. The line of general position. Determination of the natural value of the line segment of the general position and the angles of inclination of the line to the projection planes. Belonging of a point to a straight line. Division of a line segment in a given ratio. Traces of a straight line. Determination of the natural value of the line segment of the general position and the angles</p>

	<p>of inclination to the projection planes by the methods of replacing the projection planes and by the right-angled triangle method. The relative position of two straight lines.</p> <p>Didactic tools: https://do.ipokpi.ua/course/view.php?id=3352; workbook from the course [7].</p> <p>Recommended literature: [3], chapter 1, pages 18-24, chapter 2, pages 46-48; [6], chapter 1, pp. 36-55, chapter 2, pp. 152-153, 156-158, 165-167.</p> <p>ISW: Doing homework in the workbook on the given topic [7].</p>
3	<p>Projection of the plane.</p> <p>Specifying the plane on the epurse. Areas of special position. Trace-projection of the plane of a special position. Planes of general position. Belonging to a line and a point in a plane. The relative position of two planes. Curved lines</p> <p>Parallelism of planes. Intersection of planes of a special position. Intersection of planes of general and special position. Determination of natural quantities. Circle projection.</p> <p>Didactic tools: https://do.ipokpi.ua/course/view.php?id=3352; workbook from the course [7].</p> <p>Recommended literature: [3], chapter 1, pages 24-30, chapter 2, pages 31-32, 37, 48-50, chapter 3, pages 64-65; [6], chapter 1, pp. 56-64, 66-81, 83-85, 90-96, chapter 2, pp. 154-168.</p> <p>ISW: Doing homework in the workbook on the given topic [7].</p>
4	<p>Surfaces. Their image. Lines and points on the surface.</p> <p>Methods of assignment of surfaces, determinants of surfaces. Classification of surfaces. Linear surfaces. Expandable and non-expandable surfaces. Non-linear surfaces.</p> <p>Didactic tools: https://do.ipokpi.ua/course/view.php?id=3352; workbook from the course [7].</p> <p>Recommended literature: [3], chapter 3, pages 60-63, 65-84; [6], ch. 3, p. 222-245.</p> <p>ISW: Doing homework in the workbook on the given topic [7].</p>
5	<p>Intersection of surfaces by a plane.</p> <p>General method of crossing surfaces with a plane. Construction of the line (figure) of the intersection of second-order surfaces by planes of individual and general position. Determination of the natural size of the cross-sectional figure.</p> <p>Didactic tools: https://do.ipokpi.ua/course/view.php?id=3352; workbook from the course [7].</p> <p>Recommended literature: [1], ch. 10, p. 294 - 295, ch. 9 p. 271; [6], ch. 3, p. 246-259, p. 272-292.</p> <p>ISW: Doing homework in the workbook on the given topic [7].</p>
6	<p>Working drawings and sketches of details.</p> <p>Thread Image and designation of threads on the drawing. Roughness. Image and designation of roughness on the drawing.</p> <p>Didactic tools: www.udeantu-kpi.kiev.ua; reference tables, methodical maps, https://do.ipokpi.ua/course/view.php?id=3352.</p> <p>Recommended literature: [5], ch. 3, p. 223 - 230, p. 245-260.</p> <p>ISW: Making a sketch of a cap nut.</p>
7	<p>Single penetration of surfaces. Views and sections on drawings. General method of solving problems for single penetration of surfaces. The main provisions of the standard DSTU3321:2003, DSTU 2.307:2013. Applying dimensions.</p> <p>Didactic tools: www.udec.ntu-kpi.kiev.ua; https://do.ipokpi.ua/course/view.php?id=3352 workbook from the course [7].</p> <p>Recommended literature: [3], ch. 4, p. 85-90; [6], ch. 3, p. 331-360.</p> <p>ISW: Doing homework in the workbook on the given topic [7].</p>

8	<p>Intersection of surfaces. Individual cases of intersection of surfaces, use of mediators - planes of a separate position, spheres. Monge's theorem.</p> <p>Didactic tools: https://do.ipk.kpi.ua/course/view.php?id=3352. workbook from the course [7].</p> <p>Recommended literature: [3], chapter 4, pages 85-90, 96-111; [6], ch. 3, p. 331-360.</p> <p>ISW: Doing homework in the workbook on the given topic [7].</p>
9	<p>Axonometric projections..</p> <p>General Information. Types of axonometry. Projection model. Isometric projections. Indicators of distortions. Construction of projections of geometric shapes.</p> <p>Didactic tools: www.udec.ntu-kpi.kiev.ua; https://do.ipk.kpi.ua/course/view.php?id=3352, workbook from the course [7].</p> <p>Recommended literature: [3], chapter 5, pages 112-118; [6], Chapter 3, p.406-422.</p> <p>ISW: Doing homework in the workbook on the given topic [7].</p>

Practical classes

Name of the practical lesson	Number of hours
<p>Practical lesson 1. Introduction to engineering graphics. Formats, scales, lines, fonts, main inscription. Graphic work "Title sheet" (A3 format).</p> <p>The problems of building a complex drawing of a point, the position of points relative to the projection planes and relative to the geometric elements of the figures are considered.</p> <p>Didactic tools: https://do.ipk.kpi.ua/course/view.php?id=3352; workbook (theoretical information on the topic of the lecture and conditions for homework and classroom tasks).</p> <p>Recommended literature: [3], chapter 1, pages 12-18; Ch. 2, p. 45, ch. 7, p. 136-148; [6], ch. 1, p. 16-35, ch. 2, p. 151.</p> <p>ISW: Doing homework in the workbook on this topic (tasks 1 - 6) [7].</p>	2
<p>Practical lesson 2. Setting a straight line on a graph. Solving problems on a complex drawing.</p> <p>Didactic tools: https://do.ipk.kpi.ua/course/view.php?id=3352; workbook (theoretical information on the topic of the lecture and conditions for homework and classroom tasks).</p> <p>Recommended literature: [3], chapter 1, pages 18-24, chapter 2, pages 46-48; [6], ch. 1, p. 36-55, ch. 2, p. 152-153, 156-158, 165-167.</p> <p>ISW: Doing homework in the workbook on this topic (tasks 11 - 17) [7].</p>	2
<p>Practical lesson 3. Projection drawing. Image. Types, sections simple, sections. Execution of the image of the model from nature. Performing simple cuts. Graphic work "Views. Cuts are simple" (format A3).</p> <p>Didactic tools: reference tables, methodical maps, work samples, models according to the option.</p> <p>Recommended literature: [3], ch. 7, p. 149-167.</p> <p>ISW: Graphic work "Types. The cuts are simple" (A3 format).</p>	2
<p>Practical lesson 4. Setting the plane on the epurse. Solving problems on a complex drawing.</p> <p>Didactic tools: https://do.ipk.kpi.ua/course/view.php?id=3352; workbook (theoretical information on the topic of the lecture and conditions for homework and classroom tasks).</p> <p>Recommended literature: [3], chapter 1, pages 24-30, chapter 2, pages 31-32, 37, 48-50, chapter 3, pages 64-65; [6], chapter 1, pp. 56-64, 66-81, 83-85, 90-96, chapter 2, pp. 154-168.</p> <p>ISW: Doing homework in the workbook on this topic (tasks 22 - 28) [7].</p>	2

<p>Practical lesson 5. Image of the model in two views. Cuts are complicated. Graphic work "Sections are complex" (A3 format). Didactic tools: Methodical maps, task maps, work samples, methodical instructions. Recommended literature: [3], ch. 7, p. 154 - 164. <i>ISW: Graphic work "Sections are complex" (A3 format).</i></p>	2
<p>Practical lesson 6. Surfaces. Solving problems on the construction of points and lines on surfaces. Didactic tools: https://do.ipk.kpi.ua/course/view.php?id=3352; <i>workbook (theoretical information on the topic of the lecture and conditions for homework and classroom tasks).</i> Recommended literature: [3], chapter 3, pages 60-63, 65-84; [6], ch. 3, p. 222-245. <i>ISW: Doing homework in the workbook on this topic (tasks 37 - 38) [7].</i></p>	2
<p>Practical lesson 7. Sketches of working drafters of details. General requirements for working drawings and detail sketches. General rules for applying dimensions. Graphic work: a drawing of a part with a thread "Cap nut" (A3 format). Didactic tools: https://do.ipk.kpi.ua/course/view.php?id=3352; <i>reference tables, methodical maps, methodical instructions, details according to options.</i> Recommended literature: [6], ch. 3, p. 251 - 255. <i>ISW: Graphic work, a sketch of a part with a thread "Cap nut" (A3 format).</i></p>	2
<p>Practical lesson 8. Sketches of working draftsmen of details. General requirements for working drawings and detail sketches. General rules for applying dimensions. Structural and technological elements. Graphic work: blueprint of the "Shaft" part (A3 format). Didactic tools: https://do.ipk.kpi.ua/course/view.php?id=3352; <i>theoretical information by topic, reference tables, methodical maps, work samples, methodical instructions, details by options.</i> Recommended literature: [5], ch. 3, p. 230 - 260, 275. <i>ISW: Execution of graphic work sketch of the "Shaft" detail (A3 format).</i></p>	2
<p>Practical lesson 9. Intersection of surfaces by a plane. Solving problems on the intersection of surfaces with a plane. Construction of the natural size of the cross-sectional figure. Sweeps. Didactic tools: https://do.ipk.kpi.ua/course/view.php?id=3352; <i>workbook (theoretical information on the topic of the lecture and conditions for homework and classroom tasks).</i> Recommended literature: [3], ch. 4, p. 85-90; [6], ch. 3, p. 331-360. <i>ISW: Completion of homework in the workbook on this topic (tasks 46-48) [7].</i></p>	2
<p>Practical lesson 10. Sketches of working drawings of details. General requirements for working drawings and detail sketches. General rules for applying dimensions. Structural and technological elements. Graphic work: sketch of the "Gear wheel" detail (A3 format). Didactic tools: https://do.ipk.kpi.ua/course/view.php?id=3352; <i>reference tables, methodological maps, technical models, methodological instructions.</i> Recommended literature: [5], chapter 3, p. 344 - 352. <i>ISW: Execution of graphic work sketch of the "Gear wheel" detail (A3 format)</i></p>	2
<p>Practical lesson 11. Assembly drawing "Connection". Conventions and simplifications on assembly drawings. Positions of parts. Graphic work "Connection" (A3 format). Didactic tools: https://do.ipk.kpi.ua/course/view.php?id=3352; <i>methodological instructions.</i> Recommended literature: [3], Chapter 10. pp. 274-284, 286-291 [5], chapter 3, p. 302 - 307. <i>ISW: Execution of assembly drawing "Connection" (A3 format).</i></p>	2

<p>Practical lesson 12. Solving problems for the construction of single and double penetration of bodies through horizontal "windows". Designing the work "Single penetration" according to the requirements of the standards.</p> <p>Didactic tools: https://do.ipk.kpi.ua/course/view.php?id=3352; workbook (theoretical information on the topic of the lecture and conditions for homework and classroom tasks).</p> <p>Recommended literature: [6], ch. 14, p. 375-403.</p> <p>ISW: Completion of homework in the workbook on this topic (tasks 53b, g, g). Execution of individual tasks of graphic work "Single Penetration" (A3 format) [7].</p>	2
<p>Practical lesson 13. Assembly drawing "Connection". Specification. Graphic work specification "Connection" (A4 format).</p> <p>Didactic tools: https://do.ipk.kpi.ua/course/view.php?id=3352; methodological instructions.</p> <p>Recommended literature: [3], chapter 10, pages 270-273; [5], p. 370 - 377.</p> <p>ISW: Implementation of the "Connection" specification (A4 format). Submission of graphic work.</p>	2
<p>Practical lesson 14. Sketch of a body part. The peculiarities of the execution of drawings of foundry parts are considered. Main view, number of images.</p> <p>Didactic tools: reference tables, methodical maps, technical models, methodical instructions.</p> <p>Recommended literature: [5], ch. 3, p. 244-258.</p> <p>ISW: Graphic work sketch of the "Body" detail (A3 format).</p>	2
<p>Practical lesson 15. Sketch of a body part. Peculiarities of applying the dimensions of cast parts, applying surface roughness markings are considered.</p> <p>Didactic tools: reference tables, methodical maps, technical models, methodical instructions.</p> <p>Recommended literature: [5], ch. 3, p. 256-282.</p> <p>ISW: Graphic work sketch of the "Hull" detail (A3 format).</p>	2
<p>Practical lesson 16. Intersection of surfaces. The shape of the line of intersection. Tasks on the construction of lines of intersection of two surfaces of the second order are performed with the help of intermediaries. Individual cases.</p> <p>Didactic tools: : https://do.ipk.kpi.ua/course/view.php?id=3352. Workbook (theoretical information on the topic of the lecture and conditions for homework and classroom tasks).</p> <p>Recommended literature: [3], chapter 4, pages 85-90, 96-111; [6], ch. 3, p. 331-360.</p> <p>ISW: Doing homework in the workbook on this topic (60 tasks) [7].</p>	2
<p>Practical lesson 17. Sketch of a detail of the "Shaft" type from nature.</p> <p>Didactic tools: reference tables, methodical maps, technical models, methodical instructions.</p> <p>Recommended literature: [6], ch. 3, p. 256-282.</p> <p>ISW: Graphic work sketch of the "Shaft" detail (A3 format).</p>	2
<p>Practical lesson 18. Sketch of a detail of the "Cover" type from nature.</p> <p>Didactic tools: reference tables, methodical maps, technical models, methodical instructions.</p> <p>Recommended literature: [5], ch. 3, p. 244-258.</p> <p>ISW: Graphic work sketch of the "Cover" detail (A3 format).</p>	2
<p>Practical lesson 19. Drawing up the specification of the assembly unit. Sections of the specification and features of their filling are considered.</p> <p>Didactic tools: reference tables, methodical maps, technical models, methodical instructions.</p> <p>Recommended literature: [3], chapter 10, pages 270-273 [5], chapter 3, p. 373-396.</p> <p>ISW: Graphic work specification of the assembly unit (format A4).</p>	2

<p>Practical lesson 20. Axonometric projections. Solutions to problems 45, 46 of the workbook [7].</p> <p>Didactic tools: https://do.ipk.kpi.ua/course/view.php?id=3352. Workbook (theoretical information on the topic of the lecture and conditions for homework and classroom tasks).</p> <p>Recommended literature: [3], chapter 5, pages 112-118; [6], chapter 3, pp. 406-422.</p> <p>ISW: <i>Completion of homework in the workbook on this topic (tasks 43, 44) [7].</i></p>	2
<p>Practical classes 21-22. . Assembly diagram of the node. .</p> <p>The sequence of execution of assembly drawings, selection of the number of images, conventions and simplifications on assembly drawings, drawing of dimensions are considered.</p> <p>Didactic tools: reference tables, methodical maps, technical models, methodical instructions.</p> <p>Recommended literature: [5], ch. 3, p. 377-382.</p> <p>ISW: <i>Graphic work "Assembly blueprint of a node" (format A2, A1).</i></p>	4
<p>Practical lesson 23. Modular control work</p>	2
<p>Practical lesson 24. Detailing of a drawing of a general type. A sketch of a part of the "Cover" type.</p> <p>The peculiarities of the execution of blueprints of cast parts, the application of dimensions and the roughness of the surfaces of conjugated parts are considered.</p> <p>Didactic tools: reference tables, methodical maps, technical models, methodical instructions.</p> <p>Recommended literature: [5], ch. 3, p. 244-258.</p> <p>ISW: A sketch of "Cover" type details is executed. (format A3, A4).</p>	2
<p>Practical lesson 25. Detailing of a drawing of a general type. Sketch of a part of the "Shaft" type</p> <p>Didactic tools: reference tables, methodical maps, technical models, methodical instructions.</p> <p>Recommended literature: [5], ch. 3, p. 256-282.</p> <p>ISW: A sketch of parts of the "Shaft" type is executed. (format A3, A4).</p>	2
<p>Practical lesson 26. Submission of graphic works</p>	2
<p>Practical lesson 27. Credit</p>	2

2. Student's independent work

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 control and graphic works in practical classes, preparation for the modular control work and credit.

Policy and control

1. Policy of academic discipline (educational component)

Studying the academic discipline "Engineering and computer graphics. Fundamentals of geometric modeling" 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.

The applicant's answer must demonstrate 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, 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 the practical session, then he should practice the material of this practical session at another time (with another group, at a consultation, independently, using methodical materials presented on the Sikorsky distance learning platform, video recordings, etc.).

2. Types of control and rating system for evaluating learning outcomes (RSE)

The student's rating is calculated on a 100-point scale.

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

- homework and classroom tasks (HW) on the topic of the lecture in the workbook (8 tasks);
- programmable control (PC) (5 PCs);
- modular control work;
- performance and protection of graphic works (GW) (14 GW).

Scoring criteria:

2.1. Completion of tasks in the workbook is evaluated in 2 points according to the following criteria:

- flawlessly executed work, excellent graphics, work submitted on time - 2 points;
- there are certain shortcomings in the execution, good schedule, violation of the schedule of delivery up to 2-3 weeks - 1 point;
- there are significant shortcomings in execution, satisfactory graphics, work submitted late - 0.5 points;

2.2. Programmable control (PC) (5 PCs);

- flawlessly performed work – 5 points;
- there are certain shortcomings in performance – 3 points;
- there are significant shortcomings in performance - 2 points;

2.3. Performance of the modular control work is evaluated in 10 points:

- flawlessly performed work - 10 points;
- non-significant shortcomings in the performance of work - 8 points;
- significant shortcomings in the performance of work - 3 points;
- work performed incorrectly or not performed at all - 0 points.

2.4. The execution and protection of graphic works is estimated at 2.5 points:

- flawlessly executed work, excellent graphics - 2.5 points;
- there are certain shortcomings in the performance, good schedule, violation of the schedule of delivery up to 2-3 weeks - 2 points;
- there are significant shortcomings in execution, satisfactory graphics - 1 point;

2.5. Incentive points.

Students who faithfully attended practical classes and actively worked on them can receive an additional 5 incentive points to the semester rating.

Students who participated in the Olympiad in the discipline "Engineering Graphics" receive incentive points depending on their positive achievements in this Olympiad.

Calendar control: conducted twice a semester as a monitoring of the current status of meeting the syllabus requirements.

The condition of the first calendar control is to obtain at least 25 points and perform and defend three topics in the workbook, 4 graphic works, and receive a positive evaluation from two programmed control works (in 7 weeks). The condition of the second calendar control is to obtain at least 45 points and the implementation and defense of four topics in the notebook, eight graphic works, receiving a positive evaluation from four programmed control works (in 14 weeks). The condition for obtaining a credit is the completion and defense of tasks in the workbook with 8 course topics, 12 graphic works, receiving positive grades from four programmed control works and a modular control work.

The student's rating consists of points received by the student based on the results of current control measures, incentive and penalty points. The rating assessment is given to students at the penultimate lesson of the discipline in the semester.

Students who have fulfilled all the admission requirements and have a rating of 60 or more points receive a rating corresponding to the rating without additional tests.

Students who at the end of the semester have a rating of less than 60 points perform credit work. A student who received more than 60 points in the semester, but wants to improve his result, can take part in a credit test. In this case, the final result consists of the points obtained on the credit control work and the points from RGR and graphic works.

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

3. Additional information on the discipline (educational component)

Tests are carried out in the form of a programmed control of students' knowledge at the beginning of a practical lesson for 15 - 20 minutes. The individual tasks of the programmed control in terms of subject matter and complexity correspond to the exercises that students perform in the workbook in the process of individual work in preparation for this practical lesson. The results of the test work are reported to the students at the same practical session. Such a schedule of control works ensures the systematic work of students during their study of this discipline and, as experience shows, significantly affects the improvement of the quality of education.

In practical classes, students perform 10 graphic works, which are evaluated:

- 1) "Simple cuts" - 2.5 points;
- 2) "Sections are difficult" - 5 points;
- 3) "Cog wheel" - 2.5 points;
- 4) "Cap nut" - 2.5 points;
- 5) "Shaft" - 2.5 points;
- 6) "Body sketch" - 2.5+2.5 points;
- 7) "Shaft sketch" - 2.5 points;
- 8) "Cover sketch" - 2.5 points;
- 9) "Detailing of the AD" - 2.5 points.
- 10) "Detailing of AD" - 2.5 points

Students independently perform three works:

- 1) "Transformation of the projection plane" - 5 points;
- 2) "Connection" - 10 points;
- 3) Specification – 4 points

Passing of the exam takes place by tickets. The ticket consists of two tasks. The condition of the first task includes the educational material studied in the first theoretical part of the course. Knowledge of projection methods and methods of simplifying the solution of course problems are tested. The second task is complex. The obtained competences of modeling geometric objects, the ability to apply the requirements of standards when drawing up design documentation are checked.

Working program of the academic discipline (syllabus):

Compiled by: G.V. Baskova, senior teacher of the department of sketch geometry, engineering and computer graphics.

Adopted by the [Department of descriptive geometry, engineering and computer graphics](#) (protocol No. 6 dated May 25, 2023)

Agreed by the Methodical Commission of the Faculty of Instrumentation (protocol No. 7/23 dated 22.06.2023)