



ENGINEERING GRAPHICS

Work program of the discipline (Syllabus)

Details of the discipline

Level of higher education	<i>First (bachelor's)</i>
Field of knowledge	<i>18. Manufacturing & Technology</i>
Speciality	<i>186. Publishing and printing</i>
Educational program	<i>186. Technologies of printed and electronic publications</i>
Discipline status	<i>Normative</i>
Form of study	<i>full-time (full-time)/remote/mixed</i>
Year of preparation, semester	<i>1st year, autumn</i>
Scope of discipline	<i>3 (90)</i>
Semester control / control measures	<i>Autumn Semester – Credit</i>
Timetable	<i>Autumn semester: lecture – every two weeks (18 hours); Practical classes – every week (36 hours).</i>
Language of instruction	<i>Ukrainian</i>
Information about Course Instructor / Teachers	<i>Department of Descriptive Geometry, Engineering and Computer Graphics (building 7, room 815), e-mail: http://geometry.kpi.ua/ Phone:+380 44 204 94 46 Lecturer: Senior Lecturer, Natalia Mikhlevskaya, natavikmih@gmail.com, 067 645 97 65^[1] Telegram: @NataliyaMihlevskaya Practical classes: Senior Lecturer, Natalia Mikhlevska, natavikmih@gmail.com, 067 645 97 65^[2]</i>
Course Placement	<i>https://do.ipk.kpi.ua/course/view.php?id=2870</i>

The program of the discipline

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

The main purpose of teaching the discipline "Engineering Graphics" is to form students' competencies in the system of basic knowledge from the main sections of the course, gain work experience and apply methods of geometric modeling of spatial forms using the requirements of standards.

The syllabus is structured in such a way that to complete each subsequent task, students need to apply the skills and knowledge gained in the previous one. Particular attention is paid to the principle of encouraging students to actively learn. This is facilitated by the organization of students' independent work with the help of sets of methodological materials posted on the Sikorsky distance learning platform, including video lessons, which are effective in organizing distance learning. At the same time, students have to perform practical tasks that will allow

them to solve real problems in their professional activities in the future. During the training, the following are used:

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

As a result of studying the discipline "Engineering Graphics", students receive the following competencies:

General:

1. ability to learn and master modern knowledge (GC 1);
2. knowledge and understanding of the subject area and understanding of professional activities (GC 2)
3. ability to apply knowledge in practical situations (GC 3);
4. the ability to exercise their rights and duties as a member of society, to realize the values of civil (free democratic) society and the need for its sustainable development, the rule of law, human and civil rights and freedoms in Ukraine (GC 9);
5. the ability to preserve and multiply moral, cultural, scientific values and achievements of society on the basis of understanding 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, equipment and technology, to use various types of physical activity for active recreation and a healthy lifestyle (GC 10).

Professional:

1. the ability to make informed decisions regarding the processes inherent in all stages of the production of printed and electronic publications, packaging, multimedia information products and other types of publishing and printing products (FC1);
2. Ability to apply methods and means of image construction and its three-dimensional modeling. (FC10);
3. ability to apply appropriate mathematical, scientific and technical methods (FC2);

Program Learning Outcomes:

1. apply the theories and methods of mathematics, physics, chemistry, engineering, economics to solve complex problems and practical problems of publishing and printing (PR01);
2. find, evaluate and use information from various sources necessary to solve theoretical and practical problems of publishing and printing (PR02);

The above competencies and program learning outcomes of the discipline "Engineering Graphics" are provided thanks to the knowledge of students:

- basics of descriptive geometry and engineering graphics;
- Fundamentals of Geometric Modeling;
- trends in the development of modern information technologies;
- methods of development of design documentation in accordance with the requirements of standards.

2. Prerequisites and post-requisites of the discipline (place in the structural and logical scheme of training in the relevant educational program)

The discipline lays the foundations for the study of other disciplines: information basics of electronics; fundamentals of design in electronics; computer science; measurement techniques;

analytic geometry; higher mathematics; technologies of virtual devices; course and diploma design, etc., as well as in disciplines that involve the ability to create and design traditional projection and electronic drawings of products using modern CAD, geometric and computer 3d Modeling of electronic equipment objects from the cycle of disciplines of vocational and practical training of senior students.

3. The content of the discipline Engineering and Computer Graphics. Fundamentals of Geometric Modeling.

2. Content of the discipline

Chapter 1. Projection Methods

Topic 1.1. Projection methods. Central and parallel projection. Point projection. Complex point drawing. Ways to construct the third projection of a point. The position of the points relative to the planes of projection. Direct and inverse problems.

Topic 1.2. Define a line on a diagram. Lines of special position: level and projection. Straight line of general position. Belonging of a point to a line. The division of a line segment in a given relation. Method of replacing projection planes. The main problems of the method of replacing projection planes on the example of a segment of a line of general position. The relative position of two straight lines.

Topic 1.3. Plane projection. Define a plane on a diagram. Planes of special position: level and projection. Trace-projection of the plane of special position. Planes of general position. The belonging of a line and a point to a plane. Determination of the natural size of a flat figure. Parallelism of planes. Intersection of planes of special position. Intersection of planes of general and special position. Curved lines. Projection of a circle.

Chapter 2. Geometric Modeling of Surfaces

Topic 2.1. Surfaces. Methods of defining surfaces, their definition, classification. Ruler surfaces that unfold and do not unfold. Surfaces of rotation. Construction of points and lines on the surface, the conditions for their belonging to the surface.

Topic 2.2. Axonometry. Axonometric projection of a point. Rectangular isometrics and dimetry. Axonometric projections of circles that are parallel to the main planes of projections in rectangular isometrics and dimetry and replacing them with four-centered ovals. Hatching of sections in axonometric projections.

Topic 2.3. Intersection of surfaces with a plane.

A general technique for crossing surfaces with a plane. Construction of a line (figure) of intersection of surfaces of the second order by planes of special position. Determination of the natural size of the intersection figure. Sweep.

Topic 2.4. Single penetration. General Method of Solving Problems of Single Penetration of Surfaces by Symmetrical and Asymmetrical Horizontal "Windows".

Topic 2.5. Double penetration. General Method of Solving Problems of Double Penetration of Surfaces by Horizontal Windows.

Topic 2.6. Intersection of surfaces. Some cases of intersection of surfaces, the use of intermediaries – planes of special position. Spherical intermediary method. Monge's theorem. Conclusions.

Chapter 3. Types and rules for the design of technical drawings

Topic 3.1. ESKD Standards System – Basic Provisions. Formats. Scale. Line. Fonts. Geometric drawing. Conjugation of geometric elements. Basic requirements for applying dimensions on the drawing.

Topic 3.2. Projection drawing. Featured Images. Views, sections, sections. Classification of sections. Simple cuts: horizontal, vertical, inclined. Complex cuts: stepped, broken and combined. Features of their implementation. The main provisions of the GOST 2.305-68 standard: Dimensioning.

Topic 3.3. Sketches and working drawings of parts. Slicing. Classification of slices. Image and notation of the thread on the drawing. Threaded part. Cleanliness of the surface of the part. Surface roughness parameters. Conventions for designating roughness in drawings.

Topic 3.4. Sketches and working drawings of parts. Threaded part. Cleanliness of the surface of the part. Surface roughness parameters. Conventions for designating roughness in drawings.

Topic 3.5. Part of the "shaft" type. Features of the choice of the main species. Structural and technological elements.

Topic 3.6. Assembly drawing. Threaded connections: bolt, screw, stud, purpose, types, features, calculation of the length of fasteners, images and designations in the drawing. Drawing up and drawing up a specification.

Educational Materials and Resources

References

1. Engineering graphics: textbook for students of higher educational institutions of I - II levels of accreditation / V.E.Mikhailenko, V.V.Vanin, S.M.Kovalev; Ed. - Lviv: Picha Yu.V.; Kyiv: Karavela; Lviv: Novyi Svit - 2000. - 284.
2. Vanin V.V., Blyok A.V., Gnitetskaya G.O. Formalization of design documentation. 3rd ed.- K.: Karavela, 2012.-200 p . http://geometry.kpi.ua/files/Vanin_Gniteckaja_kd1_2.pdf

3. Vanin V.V., Perevertun V.V., Nadkernichna T.M. et al. Engineering and Computer Graphics. Kyiv: BHV Publ., 2009. — 400 p.

Further reading

4. Mikhailenko V.E., Vanin V.V., Kovalev S.M. Engineering and Computer Graphics. — K.: Karavela, 2012. — 363 p.
5. Haskin A.M. Drawings. — K.: Vyscha shk., 1985. — 440 p.
6. V.V. Vanin, N.V. Bilytska, O.G. Getman, N.V. Mikhlevska. Descriptive geometry and engineering graphics. Learning tasks for programmable learning. Textbook for students of non-mechanical specialties.— K.: NTUU "KPI", 2020. — 69 p

All this literature is available in sufficient volume in the library of NTUU "KPI".

Information Resource

7. Complex of methodical materials. Distance Learning Platform "Sikorsky": <https://do.ipk.kpi.ua/course/view.php?id=2870>
8. Complex of methodical materials. Sikorsky Distance Learning Platform: <https://do.ipk.kpi.ua/course/view.php?id=3187>
9. Library <ftp://77.47.180.135/>.
10. Methodical documentation of the [department's](#) website page Educational and methodical literature: http://nq-kp.kpi.ua/index.php?option=com_content&view=article&id=37:2010-06-05-04-40-02&catid=71:narisnauch1&Itemid=13

Educational content

4. Methods of mastering the academic discipline (educational component)

The program of the discipline provides for lectures and practical classes. Methodological support for the study of the course is the use of an information resource, which presents a methodological set of materials: a lecture course with a step-by-step explanation of the educational material of individual topics of the course and the use of animation elements; video tutorials; workbook, both in print and in the form of a website with an interactive step-by-step solution of home and classroom problems posted on the Sikorsky Learning Platform. In the case of distance learning, all these materials can be used during lectures and practical classes on the Zoom platform, etc., as well as be available when organizing students' independent work within the framework of remote access to information resources at a convenient time for them.

Lectures

No Salary	Title of the lecture topic and list of main questions (list of didactic aids, references to literature and tasks for the SRS)
1	Topic 1.1. Introduction. Point projection. <u>Lecture 1. Introduction. Point projection.</u> Subject and objectives of the course. Its place in the complex of disciplines for engineering training of bachelors and masters in the energy industry. A comprehensive drawing of a point. Ways to construct the third projection of a point. The position of points relative to the planes of projection. Direct and inverse problems. Didactic aids: https://do.ipk.kpi.ua/course/view.php?id=2870 workbook http://ela.kpi.ua/handle/123456789/12345 Recommended reading: [1], chap.2, pp.55,56,60, [4]] p.6-7. CPC: Doing homework in a workbook on a given topic
2	Topic 1.2. Projection of a straight line. Projection Plane Replacement Method. <u>Lecture 2. Line projection.</u> Complex drawing of a straight line. Straight levels and projections, their properties. Determination of the natural size of a segment of a straight line of general position by replacing the planes of projection and second typical tasks. Teaching aids: https://do.ipk.kpi.ua/course/view.php?id=2870 workbook http://ela.kpi.ua/handle/123456789/12345

	Recommended reading: [1], chap.2, pp.55,56,60, [4[]] p.7-11. CPC: Doing homework in a workbook on a given topic
3	Topic 1.3. Plane projection. <u>Lecture 3.</u> Projection of a plane and a circle. Define a plane on a diagram. Planes of special position: projection and level. Trace-projection of a plane of special position. Planes of general position. Zero traces of the plane. The belonging of a line to a plane. Conversion of the plane of general position to projection and level. Teaching aids: https://do.ipk.kpi.ua/course/view.php?id=2870 workbook http://ela.kpi.ua/handle/123456789/12345 Recommended Reading: [1], chap.2, p.65, [4[]] p.12-16. CPC: Doing homework in a workbook on a given topic
4	Topic 1.4. Curved lines and surfaces. <u>Lecture 4.</u> Curved lines and surfaces. Classification of curved lines. Methods of specifying surfaces, their classification, surface determinants. Surfaces of rotation. Plotting points and lines on surfaces. Teaching aids: https://do.ipk.kpi.ua/course/view.php?id=2870 workbook http://ela.kpi.ua/handle/123456789/12345 Recommended reading: [1], chap.7, p.212, [4[]] p.17-20. CPC: Doing homework in a workbook on a given topic
5	Topic 1.5. Axonometry. <u>Lecture 5.</u> Axonometric projections. Types of axonometry. Axonometric projection of a point. Rectangular isometrics and dimetric projections. Coefficients. Building a circle in axonometry. Ways to build ovals. Axonometric representation of a model. Teaching aids: https://do.ipk.kpi.ua/course/view.php?id=2870 workbook http://ela.kpi.ua/handle/123456789/12345 Recommended Reading: [1], chap.9, p.271, [4[]] p.21-27. CPC: Completing tasks in a workbook on a given topic
6	Topic 2.1. Intersection of surfaces with a plane. <u>Lecture 6.</u> Intersection of surfaces with a plane. A general technique for crossing surfaces with a plane. Four types of problems for the intersection of surfaces by a plane. Construction of a line (figure) of intersection of second-order surfaces by separate and general position. Teaching aids: https://do.ipk.kpi.ua/course/view.php?id=2870 workbook http://ela.kpi.ua/handle/123456789/12345 Recommended Reading: [1], chap.9, p.271, [4[]] p.28-32. CPC: Doing homework in a workbook on a given topic
7,8	Topic 2.2. Single penetration construction. <u>Lecture 8.</u> Single penetration of surfaces. Views and sections in drawings. General Method of Solving Problems for Single Penetration of Surfaces. Teaching aids: https://do.ipk.kpi.ua/course/view.php?id=2870 workbook http://ela.kpi.ua/handle/123456789/12345 Recommended reading: [1], chap.10, p.288, [4[]] p.34-36. CPC: Doing homework in a workbook on a given topic

9	Topic 2.3. Intersection of surfaces <i>Lecture 9. Intersection of surfaces.</i> Individual cases of intersection of surfaces, the use of intermediaries - planes of general position, spheres. Monge's theorem. Conclusions of Monge's theorem. Individual cases of intersection of surfaces, the use of intermediaries - spheres with a variable center. Teaching aids: https://do.ipk.kpi.ua/course/view.php?id=2870 workbook http://ela.kpi.ua/handle/123456789/6764 Recommended Reading: [1], chap.10, p.294, [4] p.41-43. CPC: Doing homework in a workbook on a given topic
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Lectures

No b/o	The names of those lectures and the translation of the main nutrition (the translation of didactic sob, the power of the literatura and the beginning of the SRS)
1	Topic 1.1. Introduction. Projection of the point. <i>Lecture 1. Introduction. Projection of the point.</i> Subject and objectives of the course. In the complex of disciplines and engineering training for bachelors and masters, he is a member of the Faculty of Energy Studies. Complex chairlenik point. Ways to stimulate the third projection point. The point of the project is not very clear. Straight and Overturned Tasks. Didactic tools: https://do.ipk.kpi.ua/course/view.php?id=2870 workbook http://ela.kpi.ua/handle/123456789/6764 Recommended literature: [1], sect.2, page.55,56,60, [4] page.6-7. SIW: Doing homework in a workbook on a given topic
2	Topic 1.2. Projection of direct lines. Method of substituting the surface of the project. <i>Lecture 2. Projection of a straight line.</i> <i>Complex line drawing. Level and projecting lines, their properties. Determination of the natural value of the line segment of the general position by the method of replacing the projection planes. The first and second typical problems.</i> Didactic tools: https://do.ipk.kpi.ua/course/view.php?id=2870 workbook http://ela.kpi.ua/handle/123456789/6764 Recommended literature: [1], sect.2, page.55,56,60, [4] page.7-11. SIW: Doing homework in a workbook on a given topic
3	Topic 1.3. Projection of the area. <i>Lecture 3. Projection of a plane and a circle.</i> <i>Specifying the plane on the epurse. Planes of a special position: projecting and level. Trace-projection of the plane of a special position. Planes of general position. Zero traces of the</i>

	plane. Belonging to a line and a point in a plane. Transformation of the general position plane into the projecting and level plane. Didactic tools https://do.ipk.kpi.ua/course/view.php?id=2870 workbook http://ela.kpi.ua/handle/123456789\6764 Recommended literature: [1], sect.2, page.65, [4] pages.12-16. SIW: Doing homework in a workbook on a given topic
4	Topic 1.4. Curved lines and surfaces. Lecture 4. Curved lines and surfaces. Classification of curved lines. Methods of specifying surfaces, their classification, surface determinants. Surfaces of rotation. Construction of points and lines on surfaces. Didactic tools: https://do.ipk.kpi.ua/course/view.php?id=2870 http://ela.kpi.ua/handle/123456789\6764 workbook Recommended literature: [1], sect.7, page.212, [4] pages.17-20. SIW: Doing homework in a workbook on a given topic
5	Topic 1.5. Axonometry. Lecture 5. Axonometric projections. Types of axonometry. Axonometric projection of a point. Rectangular isometry and dimetry. Distortion coefficients. Construction of a circle in axonometry. Methods of building ovals. Axonometric image of a geometric model. Didactic tools: https://do.ipk.kpi.ua/course/view.php?id=2870 workbook http://ela.kpi.ua/handle/123456789\6764 Recommended literature: [1], sect.9, page.271, [4] pages.21-27. SIW: Doing homework in a workbook on a given topic
6	Topic 2.1. Intersection of surfaces by a plane. Lecture 6. Intersection of surfaces by a plane. General method of crossing surfaces with a plane. Four types of problems on the intersection of surfaces with a plane. Construction of the line (figure) of the intersection of second-order surfaces by planes of individual and general position. Didactic tools: https://do.ipk.kpi.ua/course/view.php?id=2870 workbook http://ela.kpi.ua/handle/123456789\6764 Recommended literature: [1], sect.9, page.271, [4] pages.28-32. SIW: Doing homework in a workbook on a given topic
7,8	Topic 2.2. Construction of single penetration.

	Lecture 8. Single penetration of surfaces. Views and sections on drawings. General method of solving problems for single penetration of surfaces. Didactic tools: https://do.ipk.kpi.ua/course/view.php?id=2870 workbook http://ela.kpi.ua/handle/123456789\6764 Recommended literature: [1], sect.10, page.288, [4] pages.34-36. SIW: Doing homework in a workbook on a given topic
9	Topic 2.3. Intersection of surfaces Lecture 9. Intersection of surfaces. Individual cases of intersection of surfaces, use of mediators - planes of general position, spheres. Monge's theorem. Conclusions of Monge's theorem. Individual cases of intersection of surfaces, use of intermediaries - spheres with a variable center. Didactic tools: https://do.ipk.kpi.ua/course/view.php?id=2870 workbook http://ela.kpi.ua/handle/123456789\6764 Recommended literature: [1], sect.10, page.294, [4] page.41-43. SIW: Doing homework in a workbook on a given topic

Practical Activities

Name of the practical activity	Number of audience hours
Topic 1.1. Introduction. Point projection. <i>Practical lesson 1. Introduction. Point projection.</i> <i>The problems of building a complex drawing of points, the position of points relative to the planes of projections and geometric elements of figures are considered.</i> Didactic tools: Workbook (theoretical information on the topic of the lecture and conditions for homework and classroom tasks). Recommended literature: [1], chapter 2, pages 55, 56, 60.	2

SIW: <i>Doing homework in a workbook on a given topic [5] page.10.</i>	
Topic 1.2. Straight line projection. The method of replacing projection planes. Practical lesson 2. Projection of a straight line. The problems of building a complex line drawing are considered; determination of the natural value of the line segment of the general position by the method of replacing the projection planes; construction of spatial geometric figures. Didactic tools: Workbook (theoretical information on the topic of the lecture and conditions for homework and classroom tasks; individual tasks of the first chapter). Recommended literature: [1], chapt.2, pages.55,56,60. SIW: <i>Doing homework in a workbook on a given topic [5] page.11. Performing an individual task of the first diagram.</i>	2
Topic 1.3. Projection of the plane. Practical lesson 3. Projection of a plane and a circle. The problems of constructing the property of a line and a point on a plane are considered; transformation of the general position plane into a projecting and level plane; the projection of a circle, which is located in the planes of a separate and general position. Didactic tools: <i>Workbook (Theoretical Views on the Topic of Lectures and Conditions to Home Skills and Classroom Tasks).</i> Recommended literature: [1], chapt.2, page.65. SIW: <i>Doing homework in a workbook on a given topic [5] page. 17. Performing an individual task of the first diagram.</i>	2
Topic 1.3. Projection of the plane. Practical lesson 4. Projection of a plane. Preparatory tasks for the individual task of the first diagram are performed Didactic tools: <i>Workbook (theoretical information on the topic of the lecture and conditions for individual tasks of the first diagram).</i> Recommended literature: [1], chapt.2, page.65, [4] pages.12-16. SIW: <i>Performing an individual task of the first diagram.</i>	2
Topic 1.4. Curved lines and surfaces. Practical lesson 5. Curved lines and surfaces. The problems of constructing points and lines on surfaces of revolution are considered. Projection drawings of surfaces of rotation are being built.	2

Didactic tools: Workbook (theoretical information on the topic of the lecture and conditions for home exercises and classroom tasks; Individual tasks of the third diagram). Recommended literature: [1], chap.7, page.212 , [4] pages.17-20. SIW: Doing homework in a workbook on a given topic [5] pages. 22-23.	
Topic 1.5. Axonometry. Practical lesson 6. Axonometric projections. Tasks on the construction of details in rectangular isometry and frontal oblique isometry are considered. Methods of building ovals. Execution of cutouts and cross-hatching. Didactic tools: Workbook (theoretical information on the topic of the lecture and conditions for home exercises and classroom tasks; individual tasks of the second diagram). Recommended literature: [1], chapt.9, page.271 , [4] pages.21-27. SIW: Doing homework in a workbook on a given topic [5] page.30. Performing an individual task of the second diagram.	2
Topic 2.1. Intersection of surfaces by a plane. Practical lesson 7. Intersection of surfaces by a plane. Sweeps. Tasks on the construction of a line (figure) of the intersection of surfaces with planes of a separate and general position are performed. Didactic tools: Workbook (theoretical information on the topic of the lecture and conditions for home exercises and classroom tasks). Recommended literature: [1], chapt.9, page.271 , [4] pages.28-32. SIW: Doing homework in a workbook on a given topic [5] page.36. Performing an individual task of the second diagram.	2
Topic 2.2. Single penetration. Practical lesson 8. Single penetration of surfaces. Views and sections on drawings. Tasks on the construction of lines of single penetration of surfaces by symmetric and asymmetric horizontal windows are performed. Didactic tools: Workbook (theoretical information on the topic of the lecture and conditions for home exercises and classroom tasks). Recommended literature: [1], chapt.10, page.288 , [4] pages.36-38. SIW: Doing homework in a workbook on a given topic [5] page.42.	2

Performing an individual task of the fifth diagram.	
Topic 2.3. Intersection of surfaces. Practical lesson 9. Intersection of surfaces. Tasks on the construction of lines of intersection of two surfaces of the second order are performed with the help of intermediaries. Didactic tools: <i>Workbook (theoretical information on the topic of the lecture and conditions for home exercises and classroom tasks).</i> Recommended literature: [1], chapt.10, page.294 , [4] pages.41-43. SIW: <i>Doing homework in a workbook on a given topic [5] page.47.</i>	2
Topic 3.1. The system of USCD standards - the main provisions. Practical lesson 10. The system of USCD standards - the main provisions Introduction. General rules for design drawings. The system of USCD standards. Formats, scales, lines, fonts, sizing. Didactic tools: <i>reference tables, methodical maps, work samples.</i> Recommended literature: [3], GOST 2.301-68.- GOST 2.304-80, GOST 2.307-68 SIW: <i>Processing of lecture materials. Execution of drawings of flat parts. "Geometric drawing"</i>	2
Topic 3.2. Projection draftsman. Images: views, sections, sections. Applying dimensions. Practical lesson 11,12. Images: views, cuts, cross-sections.. Drawing dimensions General provisions of the image of geometric shapes on drawings, taking into account the standards. Features of the image of external and internal forms of geometric models. Application of views, cuts and cross-sections. Concept, purpose, classification, features of location and designation on drawings. Principles of choosing the type and number of required images on the drawing. Selection of the main species. Combining part of the view and section. Conventions and simplifications when performing images. Applying dimensions. Dimensions of position and shape. Implementation examples. Didactic tools: <i>reference tables, methodological maps, work samples, wooden models.</i> Recommended literature: [3], GOST 2.305-68. SIW: <i>Processing of lecture materials. Making a projection drawing of a wooden model. "The simple cuts"</i>	4
Topic 3.2. Projection draftsman.	

Images: views, complex sections, sections. Applying dimensions. Practical lesson 13. Images: views, complex sections, cross-sections Concept, purpose, classification. Peculiarities of performing stepped and broken cuts, location and designation on drawings. Applying dimensions. Concept of bases. Didactic tools: <i>reference tables, methodological maps, task maps, work samples.</i> Recommended literature: [3], GOST 2.305-68. SIW: <i>Processing of lecture materials. Execution of the projection drawing of the model given by two views. "The complex cuts"</i>	2
Topic 3.3. Working drawings and sketches of details. Practical lesson 14. Thread and its classification. Structural and technological elements of parts. Cut it, its purpose. Classification of the thread. Image and notation of the thread on the drawings. Didactic tools: <i>reference tables, methodological maps, details.</i> Recommended literature: [3, 7], chapt.3, 4, 5, pages.26-78. SIW: <i>Processing of lecture materials.</i>	2
Topic 3.3. Working drawings and sketches of details. Practical lesson 15. Sketches and working drawings of details. "Cap nut" type detail General requirements for working drawings of details. Sketches: stages of development. Sequence of execution of sketches. Designation of materials and surface roughness on sketches and drawings. Structural and technological elements of parts. General rules for applying dimensions. Sketch of a detail of the "Cap nut" type. Construction on the drawing of the line of intersection of the surface of the chamfer with the faces of the nut. Didactic tools: <i>reference tables, methodical maps, task maps, work samples, details according to options.</i> Recommended literature [1], chapt.10, page.294. SIW: <i>Processing of lecture materials. Execution of a sketch of a part with a thread.</i>	2
Topic 3.3. Working drawings and sketches of details. <i>Practical lesson 16. Sketches and working drawings of details. Part of the "Shaft" type.</i> <i>Peculiarities of making sketches of parts of the "Shaft" type. Structural and technological elements of parts. General rules for applying dimensions. Sketch of a detail of the "Shaft" type. Construction of sections.</i>	2

Didactic tools: reference tables, methodical maps, task maps, work samples, details according to options. Recommended literature: [1], chapt.9, page.271. SIW: Processing of lecture materials. Making a sketch of a part of the "Shaft" type.	
Topic 3.4. Structural elements of assembly units. Practical lesson 17. Threaded connections. Connection using screws, pins, and bolts. Calculation of the lengths of fasteners according to options. Compilation of conditional designations. Drawing up the specification.<i>Didactic tools:</i> ▪ <i>reference tables, methodological maps, task maps, work samples;</i> ▪ <i>methodical instructions</i> Recommended literature: [4], pages.228-247, pages. 305-310. [4], chapt.21, pages.328-343. [4], chapt.23, pages.379-380. SIW: Construction of a drawing of threaded connections. Marking of item numbers. Drawing up the specification.	2
<u>Practical lesson 18. Credit</u>	2

Independent work of student

hours assigned to the student's independent work are specified in clause 5. The method of mastering the academic discipline is the performance of homework, preparation for the performance of work in practical classes; performance of calculation and graphic work, as well as preparation for the test.

Policy and control

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;

- compliance with the schedule for the protection of calculation and graphic work. 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.).

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 (DZ) on the topic of the lecture in the workbook (7 tasks);
- programmable control (PC) (4 PCs);
- performance and protection of graphic works (RG) (10 tasks);

2. 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 performance, good schedule, violation of the schedule of delivery up to 2-3 weeks - 1 point;
- there are significant shortcomings in the execution, satisfactory graphics, untimely submitted work - 0 points;

2.2. Programmable control (PC) (4 PCs);

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

2.3. Execution and protection of graphic works:

- Geometric drawing, 3 euphras: Method of replacing projection planes. Intersection of a surface by a plane. Single penetration; specification to the assembly drawing

impeccably executed work, excellent graphics - rated at 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;

- Simple cuts, Complex cuts, Cap nut, Shaft, Threaded connections - impeccably executed work, excellent graphics are rated 10 points each.

- there are certain shortcomings in the execution, good schedule, violation of the schedule of delivery up to 2-3 weeks - 8 points;

- there are significant shortcomings in execution, satisfactory graphics - 6 points;

- incentive points – 1 point.

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 25 points and the implementation and defense of three topics in the workbook, three graphic works, receiving a positive evaluation from two programmed control works. The condition of the second calendar control is to obtain at least 45 points and to perform and defend five topics in the notebook, six graphic works, and receive a positive evaluation from four programmed control works. The condition for obtaining credit is the completion of tasks in the workbook with 7 course topics, 10 graphic works, receiving positive grades from four programmed control works

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

<i>Number of points</i>	<i>Mark</i>
100-95	Excellent
94-85	Very good
84-75	Good
74-65	Satisfactory
64-60	Enough
Less than 60	Unsatisfactory
Admission conditions are not met	Not admitted

Additional information on the discipline (educational component)

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: N.V. Mikhlevska, senior teacher of the department of sketch geometry, engineering and computer graphics.

Adopted by the Department of the National Institute of Health Sciences (protocol No. 6 dated 05/25/2023)

Agreed by the Methodical Commission of the NN VPI (protocol No. 6 dated 06/16/2023)

Agreed by the Scientific Council of NNVPI (protocol No. 11 dated 06/26/2023)