

**MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE  
DNIPRO UNIVERSITY OF TECHNOLOGY**

**The Department of Generative Design**

«APPROVED»

Head of the Department

Ziborov K. \_\_\_\_\_

«31» August 2021

**DISCIPLINE CURICULLUM**

**«Computer Graphics»**

Field of study .....	14 Electrical engineering
SPECIALTY .....	141 Electric Power Engineering, Electrical Engineering and Electromechanics
Educational Level.....	First (bachelor)
Educational-Professional program	Electric Power Engineering, Electrical Engineering and Electromechanics
Status .....	compulsory
Total volume	4 credits ECTS (120 hours)
Form of final control	credit
Term of teaching	1-2 semester, 2,3,4 quaters
Language of teaching	English

Lecturer: Fedoriachenko Sergii

Prolonged: for 2021/2022 a.y. \_\_\_\_\_ (Ziborov K.) «\_\_» 20\_\_ year.  
(signature, last name, first name, date)

for 20\_\_/20\_\_ a.y. \_\_\_\_\_ (\_\_\_\_\_) «\_\_» 20\_\_ year.  
(signature, last name, first name, date)

Dnipro  
Dnipro University of Technology  
2021

Discipline curriculum of the discipline "Computer Graphics" for the bachelor of specialty 141 "Electric Power Engineering, Electrical Engineering and Electromechanics" / Fedoriachenko S. / Dnipro University of Technology, Dept. Generative Design. - D.: DUT, 2021. - 13 p.

Authors:

Fedoriachenko Serhii, PhD, associated professor of the Generative Design Department;

The Curriculum regulates:

- Purpose of the discipline;
- Discipline learning outcomes formulated on the basis of curriculum's anticipated learning outcomes' transformation;
- Basic subjects;
- Volume and distribution by forms of organization of the educational process and types of training classes;
- Program of the discipline (thematic plan by types of training sessions);
- Algorithm for assessing the level of achievement of disciplinary learning outcomes (scales, tools, procedures and assessment criteria);
- Tools, equipment and software;
- Recommended sources of information.

The program is designed to implement a competence-based approach to planning the educational process, teaching the discipline, preparing students for control activities, control of educational activities, internal and external quality control of higher education, accreditation of educational programs within the specialty.

Approved by the decision of the Scientific-Methodical Commission of specialty 141 «Power electrical engineering, electrical engineering and electromechanics» at the request of the Department of Higher Mathematics (protocol № 21\22-01 dated 30.08.2021).

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## 1 PURPOSE OF THE COURSE

In the educational and professional program of the Dnipro University of Technology specialty 141 " Electric Power Engineering, Electrical Engineering and Electromechanics " the distribution of learning outcomes (PRN) by organizational forms of educational process. In particular, the discipline Б4 "Computer Graphics" includes the following learning outcomes: "

ПІП17	Solve complex specialized problems in the design and maintenance of electromechanical systems, electrical equipment of power plants, substations, systems and networks
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**The purpose** of the discipline is to form competencies in the means of depicting spatial forms on a plane with the use of computer technology, which is the foundation on which the basic rules of technical drawing are based. This is necessary for personnel in higher education in technical specialties, whose future production functions are related to the preparation of design documentation that should meet the needs of production.

Achieving the goal requires the transformation of program learning outcomes into disciplinary and adequate selection of the content of the discipline according to this criterion.

## 2. EXPECTED DISCIPLINARY LEARNING OUTCOMES

Code of PLO	Disciplinary learning outcomes (DLO)	
	Code of DLO	content
ПІП17	ПІП17.1-Б4	Use the concepts and laws of descriptive geometry to formulate and solve scientific and scientific-technical problems with the reflection of geometric objects on the plane.
ПІП17	ПІП17.2-Б4	Use the tools of modern information technology AutoCAD system to perform drawings of parts, complex couplings, three-dimensional models and schematic diagrams.

## 3. BASIC DISCIPLINES

The course "Engineering and Computer Graphics" is taught in the 1st year according to the curriculum, so there are no additional requirements for the basic disciplines. Interdisciplinary links: the study of the course is based on the knowledge gained from previously studied disciplines in secondary education.

#### 4. VOLUME AND DISTRIBUTION BY FORMS OF ORGANIZATION OF THE EDUCATIONAL PROCESS AND TYPES OF EDUCATIONAL CLASSES

Type of training sessions	Volume, hours	Distribution by forms of study, hours					
		Full-time		Part-time		extramural	
		Class work	Individual work	Class work	Individual work	Class work	Individual work
lectures	69	29	40	-	-	-	-
practical	-	-	-	-	-	-	-
laboratory	51	17	34	-	-	-	-
seminars	-	-	-	-	-	-	-
TOTAL	120	46	74	-	-	-	-

#### 5 DISCIPLINE PROGRAM BY TYPES OF EDUCATIONAL CLASSES

Code of DLO	Types and topics of training sessions	Volume of components, hours
	<b>Lectures</b>	<b>69</b>
ПП17.1-Б4 ПП17.2-Б4	Preface. Point. Central, parallel and orthogonal projections. Point and its projections. G. Monge's method. The law of projection.	4
	Straight. Position of the line relative to the planes of projections. The natural value of the line of general position, its angles of inclination to the planes of projections.	4
	Traces of a straight line. Reciprocal position of a point and a line, two lines. Projection of angles.	4
	Plane. Ways to set the plane on a complex drawing. Classification of planes. Straight and point in the plane.	4
	Basics of drawing. Basic rules of drawing.	4
	Projection of geometric bodies. Projections of a point and a straight line belonging to the surface of an object. Construction of the third projection on two given.	4
	Image. See. Sections. Incisions. Classification of sections.	8
	Working machine-building drawings. Text inscriptions on drawings. Designation of materials on drawings of details. Schematic electrical diagrams.	8
	Reese. Conventional image and designation of the thread. Elements of cutting.	4
	Standard threaded fasteners and their designations. Threaded connections	5
	Basic rules for sketches and working drawings.	6
	Reading and detailing assembly drawings. Features of the design of the assembly drawing. Specifications.	6
	Control measures	4
	<b>LABORATORY CLASSES</b>	<b>51</b>
	Introduction to the AutoCAD interface. Graphic primitive and editing commands in AutoCAD. Development of a template for drawings.	5
Conjugate geometric objects.	6	
2D креслення трьох виглядів деталі по научному зображенню.	6	

<b>Code of DLO</b>	<b>Types and topics of training sessions</b>	<b>Volume of components, hours</b>
	2D drawing of three kinds of details on two set kinds. Making the necessary incisions.	8
	Execution of the drawing of the basic electric scheme.	8
	Building a 3D model of a simple detail. Creating associative base views and sections from a 3D model	8
	Building a 3D model of a complex part. Creating associative base views and sections from a 3D model	8
	Control measures	2
<b>TOTAL</b>		<b>120</b>

## **6. EVALUATION OF LEARNING OUTCOMES**

Certification of student achievement is carried out through transparent procedures based on objective criteria in accordance with the Regulations of the University "On the evaluation of learning outcomes of higher education." The achieved level of competencies relative to the expected ones, which is identified during the control activities, reflects the real result of the student's study in the discipline.

### **6.1 Scales**

Assessment of academic achievements of students of DUT is carried out on a rating (100-point) and institutional scales. The latter is necessary (in case of the official absence of a national scale) for the conversion (translation) of grades of mobile students.

#### *Scales for assessing the academic achievements of students of DUT*

<b>Rating</b>	<b>Institutional</b>
90...100	Excellent
74...89	Good
60...73	Satisfactory
0...59	Fail

Credits of the discipline are credited if the student received a final grade of at least 60 points. The lower grade is considered to be an academic debt that is subject to elimination in accordance with the Regulations on the organization of the educational process of DUT.

### **6.2 Means and procedures**

The content of diagnostic tools is aimed at controlling the level of knowledge, skills, communication, autonomy and responsibility of the student according to the requirements of the NQF to the 6th qualification level during the demonstration of learning outcomes regulated by the work program. The student must perform tasks aimed exclusively at demonstrating disciplinary learning outcomes at control

activities (Section 2).

Diagnostic tools provided to students at control activities in the form of tasks for current and final control, are formed by specifying the initial data and the method of demonstrating disciplinary learning outcomes. Diagnostic tools (control tasks) for the current and final control of the discipline are approved by the department. The types of diagnostic tools and assessment procedures for the current and final control of the discipline are given below.

*Diagnostic tools and evaluation procedures*

Educational class	CURRENT CONTROL		FINAL CONTROL	
	diagnostic tools	procedures	засоби діагностики	procedures
lectures	control tasks for each topic	performing the task during lectures	complex control work (CCW)	determination of the average result of current controls
practical	control tasks for each topic	performing the task during practical classes		performing of CCW during the exam at the request of the student
	or an individual task	performing the task during individual work		
Laboratory	control tasks for each topic or individual task	performing tasks during independent work		

During the current control, lectures are evaluated by determining the quality of specific control tasks. Practical classes are assessed by the quality of the control or individual task.

If the content of a certain type of classes is subject to several descriptors, the integral value of the assessment can be determined taking into account the weights set by the teacher.

If there is a level of results of current controls in all types of classes at least 60 points, the final control is carried out without the participation of the student by determining the weighted average of current grades.

Regardless of the results of the current control, each student during the exam has the right to perform the CCW, which contains tasks that cover key disciplinary learning outcomes.

The number of specified tasks of the CCW should correspond to the allotted time for execution. The number of CCW options should provide individualization of the task.

The value of the assessment for the implementation of the CCW is determined by the average assessment of the components (specified tasks) and is final. The integral value of the assessment of the implementation of the CCW can be determined taking into account the weights set by the department for each descriptor of the NQF.

### 6.3 Criteria

Actual student learning outcomes are identified and measured relative to what is expected during the control activities using criteria that describe the student's actions to demonstrate the achievement of learning outcomes.

To assess the performance of control tasks during the current control of lectures and practical classes the coefficient of mastery is used as a criterion, which automatically adapts the assessment indicator to the rating scale:

$$O_i = 100 a/m,$$

where  $a$  is a number of correct answers or significant operations performed in accordance with the decision standard;  $m$  is the total number of questions or significant operations of the standard.

Individual tasks and complex tests are assessed expertly using criteria that characterize the ratio of requirements to the level of competencies and indicators of assessment on a rating scale. The content of the criteria is based on the competency characteristics defined by the NQF for the master's level of higher education (below).

#### *General criteria for achieving learning outcomes for the 6th qualification level for NQF (bachelor)*

NQF descriptors	Requirements for knowledge, skills, communication, autonomy and responsibility	Indicator of evaluation
<i>Knowledge</i>		
<ul style="list-style-type: none"> <li>◆ conceptual knowledge acquired in the process of learning and professional activity, including certain knowledge of modern achievements;</li> <li>◆ critical understanding of basic theories, principles, methods and concepts in teaching and professional activities</li> </ul>	The answer is excellent - correct, reasonable, meaningful. Characterizes the presence of: - conceptual knowledge; - high level of mastery of the content of the issue; - critical understanding of basic theories, principles, methods and concepts in teaching and professional activities	95-100
	The answer contains minor errors or omissions	90-94
	The answer is correct, but has some inaccuracies	85-89
	The answer is correct, but has some inaccuracies and is insufficiently substantiated	80-84
	The answer is correct, but has some inaccuracies, insufficiently substantiated and meaningful	75-79
	The answer is fragmentary	70-74
	The answer demonstrates the student's vague ideas about the object of study	65-69
	The level of knowledge is minimally satisfactory	60-64
	The level of knowledge is unsatisfactory	<60
<i>Skills</i>		
<ul style="list-style-type: none"> <li>▪ solving</li> </ul>	The answer characterizes the ability to:	95-100

NQF descriptors	Requirements for knowledge, skills, communication, autonomy and responsibility	Indicator of evaluation
<p>complex problems and problems that require updating and integration of knowledge, often in conditions of incomplete / insufficient information and conflicting requirements; conducting research and / or innovation activities</p>	<ul style="list-style-type: none"> <li>- identify problems;</li> <li>- formulate hypotheses;</li> <li>- solve problems;</li> <li>- update knowledge;</li> <li>- integrate knowledge;</li> <li>- to carry out innovative activity;</li> <li>- to carry out scientific activity</li> </ul>	
	The answer characterizes the ability to apply knowledge in practice with minor errors	90-94
	The answer characterizes the ability to apply knowledge in practice, but has some inaccuracies in the implementation of one requirement	85-89
	The answer characterizes the ability to apply knowledge in practice, but has some inaccuracies in the implementation of the two requirements	80-84
	The answer characterizes the ability to apply knowledge in practice, but has some inaccuracies in the implementation of the three requirements	75-79
	The answer characterizes the ability to apply knowledge in practice, but has some inaccuracies in the implementation of the four requirements	70-74
	The answer characterizes the ability to apply knowledge in practice when performing tasks on the model	65-69
	The answer characterizes the application of knowledge in performing tasks on the model, but with inaccuracies	60-64
	The level of skills is unsatisfactory	<60
<b>Communication</b>		
<ul style="list-style-type: none"> <li>◆ clear and unambiguous presenting of own conclusions, as well as knowledge and explanations that substantiate them, to specialists and non-specialists, in particular to students;</li> <li>◆ use of foreign languages in professional activities</li> </ul>	<p>Clarity of the answer (report). Language:</p> <ul style="list-style-type: none"> <li>- correct;</li> <li>- clean;</li> <li>- clear;</li> <li>- accurate;</li> <li>- logical;</li> <li>- expressive;</li> <li>- concise.</li> </ul> <p>Communication strategy:</p> <ul style="list-style-type: none"> <li>- consistent and consistent development of thought;</li> <li>- the presence of logical own judgments;</li> <li>- relevant reasoning and its compliance with the defended provisions;</li> <li>- correct structure of the answer (report);</li> <li>- correct answers to questions;</li> <li>- appropriate technique for answering questions;</li> <li>- ability to draw conclusions and formulate proposals;</li> <li>- use of foreign languages in professional activities</li> </ul>	95-100
	<p>Sufficient clarity of the answer (report) with minor errors;</p> <p>Appropriate communication strategy with minor flaws</p>	90-94

NQF descriptors	Requirements for knowledge, skills, communication, autonomy and responsibility	Indicator of evaluation
	Good clarity of the answer (report) and appropriate communication strategy (three requirements in total are not realized)	85-89
	Good clarity of response (report) and appropriate communication strategy (four requirements not implemented in total)	80-84
	Good comprehensibility of the answer (report) and appropriate communication strategy (five requirements in total are not fulfilled)	75-79
	Satisfactory clarity of response (report) and appropriate communication strategy (a total of seven requirements not implemented)	70-74
	Satisfactory comprehensibility of the answer (report) and communication strategy with errors (nine requirements are not implemented in total)	65-69
	Satisfactory comprehensibility of the answer (report) and communication strategy with errors (a total of 10 requirements are not implemented)	60-64
	The level of communication is unsatisfactory	<60
<b><i>Autonomy and responsibility</i></b>		
<ul style="list-style-type: none"> <li>♦ responsibility for the development of professional knowledge and practices, assessment of the strategic development of the team;</li> <li>♦ ability to further study, which is largely autonomous and independent</li> </ul>	<p>Excellent competence:</p> <ul style="list-style-type: none"> <li>- use of principles and methods of organizing team activities;</li> <li>- effective distribution of powers in the team structure;</li> <li>- maintaining a balanced relationship with team members (responsibility for the relationship);</li> <li>- stress resistance;</li> <li>- self-regulation;</li> <li>- work activity in extreme situations;</li> <li>- the level of personal attitude to the case;</li> <li>- mastery of all types of educational activities;</li> <li>- degree of possession of fundamental knowledge;</li> <li>- the appropriate level of formation of general educational skills and abilities</li> </ul>	95-100
	Confident mastery of the competencies of autonomy and responsibility with minor flaws	90-94
	Good mastery of autonomy and responsibility competencies (two requirements not met)	85-89
	Good mastery of autonomy and responsibility competencies (three requirements not met)	80-84
	Good mastery of autonomy and responsibility competencies (four requirements not met)	75-79
	Satisfactory mastery of autonomy and responsibility competencies (five requirements not met)	70-74
	Satisfactory mastery of autonomy and responsibility competencies (six requirements not met)	65-69

NQF descriptors	Requirements for knowledge, skills, communication, autonomy and responsibility	Indicator of evaluation
	Satisfactory mastery of autonomy and responsibility competencies (fragmentary level)	60-64
	The level of autonomy and responsibility is unsatisfactory	<60

## 7. TOOLS, EQUIPMENT AND SOFTWARE

Technical training

Activated university mail account (student.i.p. @ Nmu.one) at Office365.

Electronic library of the department for educational and methodological support of the discipline.

Software: Windows, MS Office, Autodesk AutoCAD

MOODLE remote platform.

## 8. Recommended sources of information

1. Інженерна та комп'ютерна графіка [Текст]: підручник для студентів вищих закл. освіти /О.І. Додатко. – Д.: “Національний гірничий університет”, 2010. – 286 с.

2. Інженерна графіка в гірництві [Текст]: навч. посібник /О.І. Додатко. – 3-тє вид. доп. та виправл. – Д.: ДВНЗ “Національний гірничий університет”, 2011. – 281 с.

3. Ванжа Г.К.Машинобудівне креслення [Текст]: навч. посібник / Г.К. Ванжа, О.О. Якушева, Г.С. Тен, І.В. Вернер. – Д.: Національний гірничий університет, 2011. – 168 с.

4. «Нарисна геометрія та інженерна графіка (розділ «Нарисна геометрія»). Методичні вказівки до аудиторної і самостійної робіт для студентів напряму підготовки 6.050301 Гірництво / О.С.Жовтяк, Т.С.Савельєва, Г.С. Тен - Д.: ДВНЗ «НГУ», 2016. – 55 с.

5. Методичні рекомендації з геометричного та проекційного креслення з дисципліни «Інженерна графіка»/О.С. Жовтяк, Т.С. Савельєва, Д. С. Пустовой, – Дніпро: ДВНЗ «НГУ», 2017. – 64 с.

6. Методичні рекомендації з виконання креслення нарізей з дисципліни «Інженерна графіка» за спеціальністю 184 «Гірництво» /О.С. Жовтяк, Т.С. Савельєва, Д. С. Пустовой, – Дніпро: ДВНЗ «НГУ», 2018. – 43 с.

7. Інженерна графіка. Методичні рекомендації з проекційного креслення / Т.С. Савельєва, Д.С. Пустовой; Нац. техн. ун-т «Дніпровська політехніка». – Дніпро: НТУ «ДП», 2020. – 52 с.

8. Ванжа Г.К. Геометричне креслення [Текст]: навчально-наочний посібник / Г.К. Ванжа, О.С. Жовтяк, О.О. Якушева, А.С. Тен – Д.: Національний гірничий університет, 2013. – 242 с.

9. Ванжа Г.К. Проекційне креслення [Текст]: навчально-наочний посібник / Г.К. Ванжа, С.В. Балашов, Т.А. Кузнецова, О.В. Федоскіна – Д.: Національний гірничий університет, 2013. – 242 с.

10. Ванжа Г.К. Складальне креслення [Текст]: навчально-наочний посібник / Г.К. Ванжа, О.С. Жовтяк, О.О. Якушева, І.В. Вернер – Д.: Національний гірничий університет, 2013. – 242 с.

11. Основи використання системи комп'ютерної графіки AutoCAD 2007. Методичні рекомендації донавчально-комп'ютерної практики для студентів напряму підготовки 6.050301 Гірництво / О.І. Додатко, С.В. Балашов, О.С. Жовтяк, Т.С. Савельєва; заред. О.І. Додатка. – Д.: Національний гірничий університет, 2010. – 56 с.

12. Графічне оформлення схем електричних принципів. Методичні вказівки до практичних занять для студентів напрямів підготовки 0501 інформатика та обчислювальна техніка; 0502 автоматика та управління; 0507 електротехніка та електромеханіка; 0509 радіотехніка, радіоелектронні апарати та зв'язок; 0510 метрологія, вимірювальна техніка та інформаційно-вимірювальні технології та 1701 інформаційна безпека./ С.В.Балашов, Л.М.Благодарна, Г.С.Тен.– Дніпропетровськ.: НГУ, 2010.–30 с.

13. Цвіркун Л.І. Інженерна та комп'ютерна графіка. AutoCAD : навч. посіб. / Л.І. Цвіркун, Л.В. Бешта; під. заг. ред. Л.І. Цвіркуна ; М-во освіти і науки України, НТУ «Дніпровська політехніка». – Дніпро: НТУ «ДП», 2018. – 209 с.

14. Балашов С.В. «Використання засобів AUTOCAD 2012 при створенні креслеників за 3d моделями»: методичні рекомендації для студ. вищ. навч. закл. / С.В. Балашов, І.В. Вернер, Т.О. Письменкова; Нац. гірн. ун-т. – Д.: НГУ, 2015. –59 с.

15. «Інженерна графіка» (розділ «Комп'ютерна графіка») Методичні рекомендації до виконання лабораторних робіт / Т.С. Савельєва, О.О. Якушева, О.В. Федоскіна –Д.: НГУ, 2013. – 38 с.

16. AutoCAD for Engineering Graphics, Gary R. Bertoline, 592p. ISBN: 9780023090424

Educational Edition

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