

**ACADEMIC DISCIPLINE SYLLABUS**  
**« ELECTRICAL EQUIPMENT OF STATIONS AND SUBSTATIONS »**



|   |  |
|---|--|
| <b>Educational Level</b>                | First (bachelor)   |
| <b>Educational-Professional program</b> | “Electrical energetics, electrical engineering and electromechanics” |
| <b>Duration of teaching Classes:</b>    | 10, 11, 12 quarters  |
| lectures:                               | 2 hours  |
| laboratory classes:                     | 1 hour   |
| <b>Language of teaching</b>             | English  |

**Course page in the system of distance education of DUT:**

<https://https://do.nmu.org.ua/course/view.php?id=1242>

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**1. Annotation to the course**

*Electrical equipment of stations and substations* - a professional educational component of the cycle of special training in the specialty 141 "Power Engineering, Electrical Engineering and Electromechanics". The discipline is taught in the third year, the course project is performed in the fourth year. The program is designed to form in higher education students holistic competencies and knowledge of design, design principles and energy efficiency of power plants and substations.

*The purpose of the discipline* - the formation of competencies in the calculation and analysis of electrical equipment of power plants and substations, practical skills in choosing power electrical equipment with the requirements of economy, reliability and quality of electricity. 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.

***Disciplinary learning outcomes (DLO):***

- Know the construction and principles of electrical equipment of stations and substations.
- Know the design features of lightning protection and grounding of electrical installations.
- Analyze the modes of operation of elements of power plants and substations for the development of energy-saving solutions.
- Choose the basic parameters, characteristics, features of structures and schemes of power plants and substations.

**2. Structure of the Course**

| <b>LECTURES</b>   | <b>LABORATORY CLASSES</b>   |
|---|---|
| 1. Calculation of short-circuit currents in schemes of stations and substations.      | 1. Research of parameters of measuring current and voltage transformers.        |
| 2. Choice of power transformers.  | 2. Study of the design and circuit solutions of closed switchgear.              |
| 3. Typical schemes of power plants and substations.                                   | 3. Study of the design and circuit solutions of open switchgear.                |
| 4. Choice of electrical equipment of power plants and substations.                    | 4. Research of control circuits of high voltage switches.                       |
| 5. System of measurement and control of the electric power in schemes of substations. | 5. Research of control schemes of disconnectors, separators and short-circuits. |
| 6. Layout of power plants and substations.  | 6. Operational switching in the schemes of power plants                         |
| 7. Own needs of power plants and substations  |   |

Also, based on the results of studying the discipline, the "Course project on electrical systems and networks" is being carried out.

### 3. Evaluation system and requirements

**3.1. The academic achievements of higher education students** based on the results of the course will be assessed on the scale below:

| Rating scale | Institutional scale |
|--------------|---------------------|
| 90 – 100     | Excellent           |
| 74 – 89      | Good                |
| 60 – 73      | Satisfactory        |
| 0 – 59       | Fail                |

**3.2** Applicants of higher education can receive a **final grade** in the academic discipline based on the current assessment of knowledge, provided that the number of points scored is at least 60 points.

Maximum rating:

| Theoretical part | The laboratory part | Bonus | Total |
|------------------|---------------------|-------|-------|
| 60               | 40                  | 5     | 100   |

During the study of the course, the applicant first completes an intermediate assessment based on the results of studies in one semester, and then takes an exam based on the results of studies in the next semester. The maximum assessment is carried out in each semester according to the above table.

The theoretical part in each semester is evaluated based on the results of passing a control test, which contains 30 questions, each worth 2 points (60 points in total).

### 3.3 Criteria for evaluating laboratory work

The laboratory part consists of two laboratory works in the initial semester, each weighing 20 points (total 40 points) and four laboratory works in the following semester, each weighing 10 points (total 40 points). Laboratory works are performed and submitted consecutively during the respective semesters and must be submitted before the theoretical part is completed.

Correctly performed laboratory work is valued at 10 points (for the final semester), wherein:

- **10 points** – full compliance with the essence of the work;
- **8 points** – compliance with the essence of the work with minor deviations and inaccuracies;
- **5 points** – partial compliance with the essence of the work without its full disclosure;
- **3 points** – there are significant errors in the execution of the work;
- **0 points** – the work is not listed or does not relate to the topic of the work.

In the case of evaluation of laboratory works in the initial semester, the same system of awarding points for work is used, with the subsequent multiplication of these points by 2.

### 3.4 Evaluation criteria of the final work

If the student of higher education received less than 60 points according to the current performance or seeks to improve the grade, a **final assessment (exam)** is conducted during the session.

**The exam** is conducted in the form of a complex control paper, which includes questions from the theoretical and practical part of the course. The ticket consists of three theoretical open tests and two practical open tests (tasks) each weighing 20 points (**100 points in total**).

Wherein:

- **20 points** – full correspondence to the essence of the question;
- **15 points** – compliance with the essence of the question with minor deviations and inaccuracies;
- **10 points** – partial correspondence to the essence of the question without its full disclosure;
- **5 points** – there are significant errors in the performance of the test;
- **0 points** – the answer is not given or does not relate to the topic of the question.

## 4. Course policy

### 4.1. Academic Integrity Policy

Academic integrity of higher education students is an important condition for mastering the results of training in the discipline and obtaining a satisfactory grade from the current and final tests. Academic integrity is based on condemnation of the practices of copying (writing with external sources other than those permitted for use), plagiarism (reproduction of published texts by other authors without attribution), fabrication (fabrication of data or facts used in the educational process). The policy on academic integrity is regulated by the Regulation "Regulations on the system of prevention and detection of plagiarism at the Dnipro University of Technology". [http://www.nmu.org.ua/ua/content/activity/usdocuments/System\\_of\\_prevention\\_and\\_detection\\_of\\_plagiarism.pdf](http://www.nmu.org.ua/ua/content/activity/usdocuments/System_of_prevention_and_detection_of_plagiarism.pdf).

In case of violation of academic integrity by a higher education applicant (copying, plagiarism, fabrication), the work is evaluated unsatisfactorily and must be repeated. The teacher reserves the right to change the topic of the task.

### 4.2. Communication policy

Applicants for higher education must have activated university mail.

All written questions to teachers regarding the course should be sent to the university e-mail.

### 4.3. Retaking policy

Works that are submitted in violation of deadlines without good reason are evaluated at a lower grade. Relocation takes place with the permission of the dean's office if there are good reasons (for example, sick leave).

### 4.4 Evaluation Appeal Policy

If the applicant does not agree with the assessment of his knowledge, he may protest the assessment given by the teacher in the prescribed manner.

### 4.5. Attending classes

For higher education students, full-time attendance is mandatory. For applicants for higher education who receive educational services under the Dual form of education, an individual schedule is provided. Good reasons for not attending classes are illness, participation in university events, academic mobility, which must be documented. The applicant for higher education must inform the teacher either in person or through the headmaster about the absence from classes and the reasons for absence.

For objective reasons (for example, academic mobility) training can take place online in consultation with the course leader.

## 5. Recommended sources of information

### Basic

1. Правила улаштування електроустановок. – Київ, 2017. -617 с. / Rules of arrangement of electrical installations. - Kyiv, 2017. -617 p.

2. Перехідні процеси в системах електропостачання: підручник / Г.Г. Півняк, І.В. Жежеленко, Ю.А. Папайка, Л.І. Несен; за ред. Г.Г. Півняка; М-во освіти і науки України, Нац. Гірн. Ун-т. – 5-те вид., доопрац. і допов. –Дніпро: НГУ, 2016. – 600 с. / Transition processes in power supply systems: a textbook / G.G. Pivnyak, I.V. Zhezhelenko, Y.A. Papaika, L. I. Necen; under the editorship of G.G. Pivnyak; Ministry of Education and Science of Ukraine, NMU – 5<sup>th</sup> ed., revised. and add. - Dnipro: NMU, 2016. - 600 p.

3. Електромагнітна сумісність у системах електропостачання: Підручник / І.В. Жежеленко, А.К. Шидловський, Г.Г. Півняк, Ю.Л. Саєнко. – Д.: Нац. гірнич. ун-т, 2009. – 319 с.: іл. / Electromagnetic compatibility in power supply systems: Textbook / I.V. Zhezhelenko, Shidlovsky A.K., G.G. Pivnyak, Yu.L. Saenko. - D .: Nat. mining. University, 2009. - 319 pp .: ill.

4. Півняк Г.Г., Шидловский А.К., Кігель Г.А., Рыбалко А.Я., Хованська О.І. Особливі режими електричних мереж. – Дніпропетровськ: НГА України, 2004. – 375 с. / 4. Pivnyak G.G., Shidlovsky A.K., Kigel G.A., Rybalko A.Ya., Khovanskaya O.I. Special modes of electrical networks. - Dnepropetrovsk: NGA of Ukraine, 2004. - 375 p.

### Supplementary

5. Г.Г. Півняк, М.М. Білий, Г.М. Бажін. Електропостачання гірничих підприємств: Довідковий посібник. – Д.: Національний гірничий університет, 2008, - 550 с. / G.G. Pivnyak, M.M. Bily, G.M. Bazhin. Electricity supply of utilities: Dovidkovy posibnik. - D .: National Girnichi University, 2008, - 550 p.