

ACADEMIC DISCIPLINE SYLLABUS

«Basics of electricity production, distribution and consumption»



Educational Level	First (bachelor)
Educational-Professional program	“Electrical energetics, electrical engineering and electromechanics”
Duration of teaching	7, 8 quarters
Classes:	Spring semester
Language of teaching	English

Course page in the system of distance education of DUT:

<https://do.nmu.org.ua/course/view.php?id=2363>

Department of Electric Power Engineering



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1. Annotation to the course

The discipline "**Basics of electricity production, distribution and consumption**" is an important educational component for bachelors in the program of specialty 141 "Electrical energetics, electrical engineering and electromechanics".

When mastering the discipline, the student will learn to: analyze the processes, operation modes and structure of electricity production, consumption, and distribution systems; assess the impact and potential of renewable generation sources; perform calculations of electrical loads, select the main electrical equipment of distribution networks and understand its application from the standpoint of energy efficiency and energy saving; to analyze strategies and problems of development of production, distribution and consumption power systems.

The purpose of the discipline - the formation of competencies to determine the structure, analysis of modes of operation and basic technical means and solutions in the systems of production, distribution and consumption of electricity in Ukraine, promising areas of electricity industry, taking into account energy efficiency and energy saving.

Disciplinary learning outcomes (DLO):

- know and understand the principles of operation of electrical systems and networks, power equipment of power plants and substations, protective earthing and lightning protection devices and be able to use them to solve practical problems in professional activities;
- Know the principles of bioenergy, wind, hydro and solar power plants;
- Understand the importance of traditional and renewable energy for successful economic development of the country;

- Apply suitable empirical and theoretical methods to reduce electricity losses during its production, transportation, distribution and use.

2. Structure of the Course

Lectures	PRACTICAL CLASSES
1 The current state of the electricity industry of Ukraine and the world. 2 Characteristics of the main systems of electricity production and consumption. 3 Features of the power system of Ukraine. 4 Characteristics of electricity consumers and their operation modes. 5 Methods of calculating electrical loads of consumers. 6 Characteristics of electrical network substations and their basic equipment. 7 Choice of power transformers and units for reactive power compensation. 8 Power lines and features of their design and selection. 9 Energy saving in industry and the municipal sector. 10 Energy Strategy of Ukraine until 2035. 11 Scenarios for the development of electricity generation systems in the IPS of Ukraine.	1 Calculation of electrical loads. 2. Calculation and selection of power transformers, power lines. 3. Analysis of the peculiarities of the operation modes of the main electrical equipment of substations and networks from the standpoint of energy- and resource-saving.
	LABORATORY CLASSES
	1. Determining the indicators of electrical load schedules of generation and consumption systems. 2. Determining the impact of non-uniformity of the schedule of electrical loads on the efficiency of electricity production. 3. Calculation of the consumers' electrical loads. 4. Reactive power compensation in electrical networks.

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 for higher education can receive a final grade in the discipline on the basis of current assessment of knowledge, provided that the number of points scored in current testing, weighted average laboratory work and practical tasks, independent work will be at least 60 points.

This number of points is taken as the arithmetic average of the marks obtained during the control measures and the passing of the laboratory work after each quarter..

Maximum rating:

Theoretical part (lectures)	Practical part	Laboratory part	Total, arithmetic average value
T	P	L	3
100		100	(T+P+L)/3

The theoretical part is evaluated based on the results of passing the control test work at the end of each quarter during the control activities:

7th quarter - control test contains 25 questions, each correct answer is worth 4 points

The 8th quarter - the test contains 4 test questions, each correct answer of which is evaluated with 5 points and 8 questions that are answered in detail.

The practical part is evaluated based on the result of solving a complex problem, which is given by the teacher at the last practical lesson before the start of control measures.

The laboratory part is evaluated as the arithmetic average of the results of the performance and defense of reports from two laboratory works processed in each quarter.

3.3. Criteria for evaluating the final work

30 test tasks with four answer options, 1 correct answer is evaluated in 1 point; (a total of 30 points); 6 test tasks with four answer options, 1 correct answer is evaluated in 2 points (a total of 12 points); 2 problems with four answer options, 1 correct answer is evaluated in 4 points; 3 problems with four answer options, 1 correct answer is evaluated in 5 points (a total of 23 points); 7 theoretical questions with a detailed answer, the correct answer is estimated at 5 points (a total of 35 points).

The test is conducted using Google Forms technology, MS Office 365.

An untimely response is considered not to have been submitted.

3.4. Criteria for evaluating practical work

Practical work is evaluated based on the result of solving a complex problem on a scale of 0-100 points, which is given by the teacher at the last practical session before the start of control measures.

3.5. Criteria for evaluating laboratory work

From each laboratory work, the student of higher education receives a separate option for implementation according to methodical instructions. Each laboratory work is evaluated on a scale of 0-100 points.

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/us_documents/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

1. Тулуб С.Б., Разумний Ю.Т., Рухлов А.В. Проблеми сучасної енергетики. Навч. посібник в 2 ч. – Д.: Національний гірничий університет, 2007. Ч. 1. – 192 с. / 1. Tulub SB, Razumny UT, Rukhlov AV Problems of modern energy. Teaching. manual in 2 hours - D.: National Mining University, 2007. Part 1. - 192 p.
2. Маліновський А.А., Хохулін Б.К. Основи електроенергетики та електропостачання: Підручник. – Львів: Видавництво Національного університету “Львівська політехніка”, 2007.– 380 с. / Malinovsky AA, Khokhulin BK Fundamentals of power engineering and power supply: Textbook. - Lviv: Lviv Polytechnic National University Publishing House, 2007.– 380 p.
3. Проектування електрообладнання об’єктів цивільного призначення. ДБН В. 2.5-23-2010. – К.: Держ. ком. України з буд-ва. та архіт., 2004. – 129 с. / Design of electrical equipment for civil purposes. DBN V. 2.5-23-2010. - K.: Держ. com. Of Ukraine from the building. and Architect., 2004. - 129 p.
4. Бондарчук А.С. Внутрішньоквартальне електропостачання. Курсове проектування. Навчальний посібник / А.С. Бондарчук, В.Г. Рудницький. – Суми: Університетська книга, 2012. – 371 с. / Bondarchuk AS Intra-quarter power supply. Course design. Textbook / A.S. Bondarchuk, VG Rudnytsky. - Sumy: University Book, 2012. - 371 p.
5. Ціни та тарифи [Електронний ресурс] www.nerc.gov.ua/ / Prices and tariffs [Electronic resource] www.nerc.gov.ua/
6. Разумний, Ю.Т. Енергозбереження: навч. посіб. / Ю.Т. Разумний, В.Т. Заїка, Ю.В. Степаненко. – Дніпропетровськ: НГУ, 2005. – 166 с. / Reasonable, Yu.T. Energy saving: textbook. way. / Ю.Т. Razumny, VT Zaika, Yu.V. Stepanenko. - Dnepropetrovsk: NMU, 2005. - 166 p.
7. Вирівнювання графіка електричного навантаження енергосистеми. Режим доступу: http://www.energetika.by/arch/~page_m21=10~news__m21=169. / Alignment of the schedule of electric load of the power system. Access mode: http://www.energetika.by/arch/~page__m21=10~news__m21=169.
8. Енергетика України 2018. Інфографічний довідник. Видання 2-ге. – 2018. – 44 с. Режим доступу: <https://businessviews.com.ua/ru/the-infographics-report-energy-of-ukraine-2018/> / Energy of Ukraine 2018. Infographic guide. 2nd edition. - 2018. - 44 p. Access mode: <https://businessviews.com.ua/ru/the-infographics-report-energy-of-ukraine-2018/>
9. Стан і перспективи розвитку технологій «інтелектуальних» електромереж, управління попитом та систем режимного управління в умовах розвитку поновлюваних джерел енергії у зарубіжній енергетичній сфері. Київ – 03/2018. Режим доступу: <https://ua.energy/wp-content/uploads/2018/04/1.-Stan-rozvytku-smart-grid.pdf> / Status and prospects of development of technologies of "intelligent" power grids, demand management and control systems in the conditions of development of renewable energy sources in the foreign energy sphere. Kyiv - 03/2018. Access mode: <https://ua.energy/wp-content/uploads/2018/04/1.-Stan-rozvytku-smart-grid.pdf> / New energy strategy of Ukraine until 2035: "SECURITY, ENERGY EFFICIENCY, COMPETITIVENESS". Access mode: <http://mpe.kmu.gov.ua/minugol/doccatalog/document?id=245213112>
10. Нова енергетична стратегія України до 2035 року: «БЕЗПЕКА, ЕНЕРГОЕФЕКТИВНІСТЬ, КОНКУРЕНТОСПРОМОЖНІСТЬ». Режим доступу: <http://mpe.kmu.gov.ua/minugol/doccatalog/document?id=245213112>
11. Звіти з оцінки відповідності (достатності) генеруючих потужностей НЕК «Укренерго». Режим доступу: <https://ua.energy/peredacha-i-dyspetcheryzatsiya/zvit-z-otsinky-vidpovidnosti-dostatnosti-generuyuchyhpotuzhnostej/#1596701774919-04e9ab60-f849> / Reports on conformity assessment (adequacy) of generating capacities of NEC Ukrenergo. Access mode: <https://ua.energy/peredacha-i-dyspetcheryzatsiya/zvit-z-otsinky-vidpovidnosti-dostatnosti-generuyuchyhpotuzhnostej/#1596701774919-04e9ab60-f849>
12. Pivniak H., Aziukovskyi O., Papaika Yu., Lutsenko I., Neuberger N. (2022). Problems of development of innovative power supply systems of Ukraine in the context of European integration. Naukovyi Visnyk Natsionalnoho Hirnychoho Universytetu, (5), 89-103. <https://doi.org/10.33271/nvngu/2022-5/089>.