SYLLABUS OF THE COURSE
"Electrical materials"

Academic degree	bachelor
Educational program	Electric power, electrical engineering and electromechanics
Period of study	2nd semester
Classes:	
lectures:	2 hours
laboratory classes:	2 hours
Language of study	Ukrainian, English

Course page in DES NTU "DP": https://do.nmu.org.ua/course/view.php?id=5793

Teaching department Electrical engineering

Lecture**:**
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1. Annotation to the course

Within the discipline of **Electrical materials**, physical phenomena occurring in electrical materials under the action of electromagnetic fields are studied. The classification of materials is given, their properties and some technological processes of production are studied. Electrical materials are essential in the design of a variety of electrical devices and apparatus. Given the trend in modern electrical engineering to increase voltages and capacities, reduce the size and weight of machines and devices and increase reliability, the role of electrical materials is becoming significant.

2. The purpose and objectives of the course

The purpose of the discipline is to form in students a system of fundamental knowledge of electrical materials for further ability to solve complex problems of innovative nature and make productive decisions in the field of metrology, taking into account the future professional activities of graduates and scientific and technological progress.

Course objectives:

gaining knowledge and acquaintance with the types of electrical materials; understand the processes arising in electrical materials that are in the electric field;

formation of abilities and skills to use the acquired knowledge at installation of electrotechnical materials in power installations and at measurement of various sizes.

3. Learning outcomes

To determine the basics of functioning of elements and principles of construction of electric power, electrotechnical electromechanical complexes and systems taking into account properties of electrotechnical materials.

4. Course structure

LECTURES

1. Dielectric materials

The main types of chemical bonds.

Polarization of dielectric materials in a constant electric field.

Types of polarization for different types of dielectrics (gaseous, liquid, solid).
Dielectric substitution scheme in terms of polarization.
Dielectric constant of different types of dielectrics.

Electrical conductivity of dielectrics in a constant electric field.

Dielectric losses in an alternating electric field. Equivalent dielectric substitution schemes with dielectric losses.
Types of dielectric losses in dielectrics. Dielectric losses for different types of dielectrics (gaseous, liquid, solid).
Breakdown of dielectric materials.

2. Conductive and magnetic materialи

Preface. Classification of conductive materials. Electrical conductivity of metals.

High conductivity conductors. Metals and alloys of high resistance.

Magnetic materials and basic information. Distribution of materials by magnetic properties.
Properties of ferromagnetic materials.

The main magnetization curve of ferromagnetic materials. Magnetic hysteresis.

Magnetic losses in ferromagnetic materials.

LABORATORY CLASSES

Study of the properties of electrical insulating materials
Determination of electrical strength of liquid dielectrics
Determination of volume and surface resistivities of solid dielectrics
Investigation of dielectric polarization
Study of the properties of magnetic materials
Investigation of the properties of magnetic materials using an oscilloscope
Determination of the specific magnetic resistance of ferromagnets
Investigation of magnetic properties of plate samples using a ferrometer

5. Hardware and / or software

When performing practical work, specialized measuring and electromechanical equipment and the MOODLE platform are used.

6. Evaluation system and requirements

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

Rating	**Institutional**
90 ... 100	Excellent
74 ... 89	Good
60 ... 73	Satisfactory
0 ... 59	Failed

6.2. 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 the current testing and independent work will be at least 60 points.

Maximum rating:

Theoretical part	The practical part		Bonus	**Together**
	With timely assembly	In case of untimely assembly		
65	30	20	5	**100**

The theoretical part is evaluated by the results of passing the test, which contains at least 40 questions.

1 hour is allotted for answering the questions of test control work

Practical works are accepted on control questions to each of work.

6.3. Criteria for evaluating the final work

At least 40 test tasks with four answer options, 1 correct answer is evaluated in 1 or 2 points depending on the difficulty (a total of 65 points). The test is conducted using Microsoft Office 365 technology.

6.4. Criteria for evaluating practical work

From each laboratory work the applicant of higher education can receive 5 points.

The arithmetic mean of laboratory work is multiplied by 6.

7. Course policy

7.1. 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 the 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 the 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.

7.2.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.

7.3. Reassembly policy

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

7.4 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.

7.5. Attending classes

For full-time higher education students, attendance is mandatory. 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, international mobility) training can take place online in consultation with the course leader.

7.6. Bonuses

At the end of the study course teacher can add getter in higher education to 5 for personal activity during lectures and practical exercises , participation in scientific-technical part are conferences , seminars and others.

8 Recommended sources of information

1. Електротехнічні матеріали: навч. посіб. / А.С. Головченко, Д.В. Ципленков, А.А. Колб, А.В. Ніколенко; Мін-во освіти і науки України, Нац. техн. ун-т «Дніпровська політехніка» – Дніпро: НТУ "ДП", 2021. – 184 с.
2. Журавльова Л.В., Бондар В.М. Електроматеріалознавство: Підручник. – К.: Грамота, 2006. –312 с.
3. Василенко І.І., Широков В.В. Василенко Ю.І. Конструкційні та електротехнічні матеріали. Навч. Посібн. – Львів. «Магнолія-2006». 2018. – 242 с.
4. Електротехнічні матеріали : навчальний посібник / В. О. Леонтьєв, С. В. Бевз, В. А. Видмиш. – Вінниця : ВНТУ, 2013. – 122 с.

5. Електротехнічні матеріали : навчальний посібник / В. О. Леонтьєв, С. В. Бевз, В. А. Видмиш. – Вінниця : ВНТУ, 2013. – 122 с.
6. Конструкційні та функціональні матеріали/ Бабак В.П., Байса Д.Ф.. У тдвох частинах. – К. Техніка. Ч1. 2003 – 344 с.; Ч2 – 368 с.
7. Електроматеріалознавство /Колесов С.Н., Колесов І.С./ −Київ: Дельта, 2008. −512 с.
8. Bartnikas R. (1994) Electrical Insulating Liquids. Philadelphia – 462 p.
9. Hari Singh Nalwa (1999). Handbook of Low and High Dielectric Constant Materials and Their Applications: Materials and processing. Academic Press. – 1100 p.
10. Helerea E., Calin M. (2015). Materials In Electrical Engineering. Publishing House Transilvania University Brasov, Romania, — 378 p.