COURSE DESCRIPTION CARD - SYLLABUS

Course name
Heat exchange [N2Eltech2-UiIE>WCwUE]

Course

Field of study
Electrical Engineering

Year/Semester
1/1

Area of study (specialization)
Distribution Devices and Electrical Installations

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
10

Laboratory classes
0

Other
0

Tutorials
10

Projects/seminars
0

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge of the construction and operation of: electrical devices and installations and measuring equipment. Basic knowledge of physics in the field of types of energy and methods of energy conversion between them. Knowledge of the basic principles of mass, momentum and energy transport in machines and engines. The ability to obtain information from subject literature and other sources and critically analyze it. The ability to use analytical, simulation and experimental tools. Understanding the need for creative action.

Course objective

The aim of the classes is to learn the principles of designing structural elements and electrical machines with heat transfer taken into account. To acquire the ability to predict the consequences resulting from heat flow between: machines and engines and their environment.

Course-related learning outcomes

Knowledge:
Student has ordered knowledge in the field of design and diagnostics of typical structural elements of switchgear.

Skills:
Student is able to use mathematical models to design and analyze the operating status of electrical equipment components. Student is able to carry out diagnostic measurements and verify the quality of the tested object.

Social competences:
Student can think and act in a professional manner. Student understands the need for education in various fields and understands the need for innovative testing of the condition of devices to ensure their operational safety.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture:
Knowledge acquired during the lecture is verified by a written final assessment, consisting of open or test questions with different points. Rewarding activity during the discussion part of the lecture as part of the open, problem-based part (PBL).
Exercises:
Current checking and rewarding knowledge necessary to implement the problems posed in a given area, evaluation of projects, rewarding activity related to the implementation of exercises within project groups (PBL).

Programme content

The course will cover: the basics of thermodynamics and fluid mechanics in part applicable to heat transfer issues. In particular: issues of heat conduction, heat transfer by forced and natural convection and thermal radiation. All three basic forms of heat transport will be discussed in relation to stationary and non-stationary issues in electrical devices.

Course topics

Laws and principles governing heat exchange, resulting from the theory of thermodynamics and fluid mechanics. Basic laws describing the process of conduction, absorption and radiation of heat. The phenomenon of heat transfer and mass diffusion. The equation describing heat exchange in solids and fluids and its forms. The role of the source term of the energy transport equation in the description of energy generated during current flow. Description of heat exchange on selected geometric shapes of electric machines. Principles of calculating the power of heat exchangers, their types, selection principles and role in heating node systems. Examples of using heat from cooling electric machines for cogeneration in industry and the living sector.

Teaching methods

Lecture:
Multimedia presentations supported by examples illustrated on the board, interactive lecture with asking questions and initiating discussions within (PBL).
Exercises:
Presentations supported by illustrated examples presented on the board, initiating teamwork within (PLB), using dedicated computer, internet, graphic applications and manufacturers' catalogs.

Bibliography

Basic:
1. Hobler T., Ruch ciepła i wymienniki, WNT, Warszawa1968.
2. Wiśniewski S., Wiśniewski T.S, Wymiana ciepła, WNT, 2017.
3. Dulniew G.N. Wymiana ciepła w urządzeniach elektrycznych i ich elementach, WNT 1967.
4 Kmieć A., Procesy cieplne i aparaty, Oficyna Wyd. Politechniki Wrocławskiej, Wrocław 2005.
5. Maksymiuk J.: Aparaty elektryczne, PWN, Warszawa, 1995.

Supplementary:
1. Holman J.P. Heat transfer, McGraw-Hill Book Company, 1963.

2. Afgan N.H., Schlunder E.U., Heat exchangers: Design and Theory Sourcebook, McGraw-Hill Book Company, 1974.
3. Warren H.G., Principles of engineering heat transfer, Lancaster Press, 1957.
4. Hartnett J.P., Irvine T.F. Jr., Pfender E., Sparrow E.M., Studies in heat transfer, McGraw-Hill Book Company, 1979.

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,00
Classes requiring direct contact with the teacher	20	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00