COURSE DESCRIPTION CARD - SYLLABUS

Course name

Modular : Basics of Electroheat and Optics Radiance

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Course

Field of study

Electrical Engineering

Year/Semester

2/4

Area of study (specialization)

Profile of study

practical

Level of study

First-cycle studies

Course offered in

polish

Form of study

full-time

Requirements

elective

Number of hours

Lecture

15

Laboratory classes

30

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

3

Lecturers

Responsible for the course/lecturer:

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Responsible for the course/lecturer:

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Prerequisites

A student starting lectures and laboratory classes on this subject should have basic knowledge of

mathematics, physics and electrical engineering acquired at earlier stages of the first degree studies - semesters 1 to 3. In addition, I should have an in optics acquired on semesters 1 and 2 - Physics and circuit theory. Should have the ability to effectively self-study in the field related to the chosen field of

study and should be able to plan and carry out simulation and measurements of basic quantities characteristic of electrical systems. The ability to interpret the results obtained and be able to draw

present the obtained results in numerical and graphic form is also required. The student should be able to interpret the result obtained and be able to draw the right conclusion. In addition, he should be ware of the need to expand his competences, readiness to cooperate within the team.

Course objective

To provide students with knowledge about the various commonly used electrothermal methods applicable in domestic electrothermia, but also about industrial electrothermal methods. Providing students with knowledge about methods and ways of heat transfer, parameters characterizing various of these methods and the relationship between material parameters and the possibility of heat transfer.

Providing students with knowledge about optical radiation, its generation and use.

Course-related learning outcomes

Knowledge

The student has knowledge of physics in the field of thermodynamics and optics, necessary to understand the basic physical phenomena occurring between heated elements and their surroundings. The student has the knowledge, knows and understands the heat transformations occurring in electrical and electrothermal technology, has a basic knowledge of methods and ways of heat transfer.

Skills

The student has the ability to use literature sources available in printed and electronic versions. The student has the ability to integrate acquired information, is able to assess their credibility, evaluate it and interpret it. The student has the ability to think independently and draw conclusions, and also has the ability to draw their own conclusions, has the ability to clearly and correctly formulate sentences expressing opinions about observed phenomena, as well as to formulate and substantiate opinions, discuss them.

The student has the ability to use their knowledge in the selection of measuring ranges of ammeters, voltmeters and wattmeters. The student has the ability to connect simple measurement systems based on electrical diagrams and without them. The student has the ability to acquire data from connected analog gauges (the ability to properly read the indications of pointer gauges) and digital. Has the ability to save measurement results correctly with specified accuracy.

Social competences

The student understands that knowledge is necessary to solve electrothermal problems and understands that knowledge about the transfer of heat energy is one of the most important when designing any electrotechnical systems. He understands that thermal restrictions are the most important and they condition the power of electrical and electronic devices.

The student understands that the technologies used to remove unnecessary thermal energy are constantly developed, therefore it is necessary to auction their knowledge and professional competence.

The student understands that as a result of the thermal parameters of electrical devices he determines, he is responsible for the jointly performed task of reliable operation of the designed and operated electrical device.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:
Knowledge acquired during lectures - assessment of knowledge and skills demonstrated in the written test. Skills and knowledge acquired during laboratory exercises: assessment of knowledge and skills related to the implementation of the exercise task, evaluation of the report of the exercise performed or under specific conditions of the size of the group implementation of multimedia presentations conducted by students: description and presentation of measurement results with conclusions.

Getting extra points for activity during classes, especially for:

- ability to cooperate within a team that practically performs a specific task in a laboratory;

- comments related to the improvement of teaching materials;

- aesthetic care of reports and tasks prepared as part of self-study

Programme content

LECTURES - Lecture with multimedia presentation presenting the thematic scope of electrotherm and its main division. - Introduction to the topic of heat transformations in electrical engineering - Presentation of the division of heat generation methods on slides, discussion on the advantages and disadvantages of flame and electrothermal heat generation with particular emphasis on the disadvantages and dvantages of each method. - Determination of the existing division of electrothermal methods: resistive, electrode, inductive, arc, plasma, capacitive, microwave, photon, electron, ionic, ultrasonic with the presentation of practical implementation of each of them - linking the theoretical content with practice. Discussion on the economic aspects of using each of the above methods. - During the lecture in relation to the knowledge possessed by students in the field of physics, presentation of the basic laws of thermokinetics. - Presenting in the multimedia form of the optical radiation range, supported by examples of practical biological effects of individual radiation ranges on living organisms and inanimate matter. - Based on applicable Standards, discussion of the risks associated with the impact of infrared, ultraviolet radiation. - Based on practical situations determining the hazards associated with blue radiation in LED lamps.

LABORATORY CLASSES - A discussion is initiated during the laboratory on the accuracy of measurements made using thermocouples, metal thermometric and semiconductor resistors as well as pyrometers and a thermal imaging camera. -Students are presented in a practical way with errors that may occur in each of the above measurement methods. There is a discussion on the efficiency of various commonly used electrothermal devices obtained during measurements, the characteristics are drawn up allowing for easy evaluation and comparison. The pros and cons of individual electrotemic methods are based on the results obtained and the knowledge from lectures. Students measure and test for the wave nature of radiation - with particular emphasis on microwave radiation, there is a discussion about the effects of it.

During the laboratory, discussions are carried out on the obtained values of the measured values radial powers generated in individual subranges of optical radiation (UV - VIS - IR). The action of optical radiation (especially UV) on materials characterized by luminescence is demonstrated. On the basis of knowledge from lectures and measurements carried out, students determine the risks associated with blue radiation in LED lamps, there is a discussion about the dangerous effects of this radiation, among others in workplaces - experimental calculations are carried out to change the light efficiency in cases other than those directly investigated during laboratories, the effects of changes in filament temperature, changes in phosphors, etc.

Teaching methods

The teaching methods used: lectures: lecture with multimedia presentation (including drawings, photos, animations, sound, films) supplemented with examples given on the board - lecture conducted in an interactive way with the formulation of questions for a group of students or specific students indicated - are included activity of students during classes during the final grade during the lecture initiating discussions - theory presented in close connection with practice - theory presented in connection with the current knowledge of students - taking into account various aspects of the issue presented, including: economic

Educational methods used: laboratories: - laboratories supplemented with multimedia presentations (photos, animations, charts) - the use of tools enabling students to perform tasks at home (proprietary software) - computational experiments - teamwork

Bibliography

Basic

1. Hauser J.: Elektrotechnika. Podstawy elektrotermii i techniki świetlnej. Wydawnictwo Politechniki Poznańskiej, Poznań 2006

2. Wolska A.: Promieniowanie optyczne w środowisku pracy. CIOP PIB, 2013.

3. Michalski L., Eckersdorf K., Kucharski J.: Termometria. Przyrządy i pomiary. Wydawnictwo Politechniki Łódzkiej, Łódź 1998

4. Wiśniewski A.: Źródła światła, Warszawa 2013

5. Materials for laboratory classes available at lumen.iee.put.poznan.pl and Moodle module

Additional

1. Hering M.: Podstawy elektrotermii cz. I. WNT, Warszawa 1992.

2. Hering M.: Podstawy elektrotermii cz. II. WNT, Warszawa 1998

Breakdown of average student's workload

	Hours	ECTS
Total workload	79	3,0
Classes requiring direct contact with the teacher	49	2,0
Student's own work (literature studies, preparation for laboratory classes/~~tutorials~~, preparation for tests/~~exam, project preparation~~) [1]	30	1,0

[1] delete or add other activities as appropriate