

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject (-)		Code 1010321341010320024
Field of study Electrical Engineering	Profile of study (general academic, practical) general academic	Year /Semester 2 / 4
Elective path/specialty -	Subject offered in: Polish	Course (compulsory, elective) obligatory
Cycle of study: First-cycle studies	Form of study (full-time, part-time) full-time	
No. of hours Lecture: 15 Classes: - Laboratory: 30 Project/seminars: -		No. of credits 3
Status of the course in the study program (Basic, major, other) other		(university-wide, from another field) university-wide
Education areas and fields of science and art technical sciences Technical sciences		ECTS distribution (number and %) 3 100% 3 100%
Responsible for subject / lecturer: dr inż. Przemysław Skrzypczak email: przemyslaw.s.skrzypczak@put.poznan.pl tel. 61 665 2585 Faculty of Electrical Engineering ul. Piotrowo 3A 60-965 Poznań		Responsible for subject / lecturer: dr hab. inż. Krzysztof Wandachowicz email: krzysztof.wandachowicz@put.poznan.pl tel. 61 665 2397 Faculty of Electrical Engineering ul. Piotrowo 3A 60-965 Poznań
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	The student has basic knowledge of mathematics, physics and electrical engineering
2	Skills	Ability to effectively self-education in a field related to the chosen field of study.
3	Social competencies	Is aware of the need to broaden their competence, willingness to work together as a team.
Assumptions and objectives of the course: -Learn about electroheat, heat transfer and the methods of measure temperature and measurement instruments. -Learn about optical radiation, its generation and use.		
Study outcomes and reference to the educational results for a field of study		
Knowledge:		
1. Knowledge of all methods of electrothermal and interaction of optical radiation - [[K_W03++]]		
2. Information about formula of heat generation by conduction current. Construction temperature meters, Basic relation and formula of heat transfer. Effects of optical radiation - [[K_W16+++]]		
Skills:		
1. Energy balance of vagarious electrothermal devices. Evaluate the effects of optical radiation - [[K_U05++]]		
2. Calculation the thermal power generated during heating - [[K_U14++]]		
Social competencies:		
1. Student can work in a group. He can share and coordinate work between team members - [[K_K01++, K_K03++]]		
Assessment methods of study outcomes		

Lecture: Assessment of knowledge and skills demonstrated in the written test

Laboratory exercises: assessment of knowledge and skills related to the performance of the exercise task, assessment of the report of the exercise

Obtaining extra points for activity during classes, especially for:

- ability to cooperate within a team practically performing a detailed task in a laboratory;
- notes related to the improvement of didactic materials;
- the aesthetic diligence of reports and assignments within their own learning

Course description

LECTURES

- Lecture with a multimedia presentation presenting the scope of the electrothermal topic and its main division,
- Introduction to the topic of electromagnetic transformations in electrical engineering,
- Presentation of the division of methods of heat production on slides, discussion on the advantages and disadvantages of flame and electrothermal heat production with particular regard to the disadvantages and advantages of each method. Determination of the division of electrothermal methods: resistance, electrode, induction, arc, plasma, capacitive, microwave, photon, electron, ionic, ultrasonic with the presentation of the practical implementation of each of them - the connection of presented theoretical content with practice. Discussion on the economic aspects of using each of the aforementioned methods.
- During the lecture in reference to the knowledge of physics students presented the basic law of thermokinetics.
- Presentation in the form of multimedia materials of optical radiation, supported by practical examples, the biological effects of the activity of particular radiation scales on living organisms and inanimate matter.
- Based on current Norms, discuss the risks associated with infrared, ultraviolet radiation.
- Based on the situation in practice, the determination of the risks associated with blue light in LEDs.

LABORATORY CLASSES

- During the laboratory discussion on the accuracy of measurements made using thermocouples, metal thermometers, semiconductor resistors and pyrometers and thermal imaging cameras is initiated.
- Practical students are acquainted with errors that may occur in any of the above methods of measurement.
- A discussion on the performance of various consumer electrothermal devices is made, and features that allow for easy assessment and comparison are drawn. The advantages and disadvantages of particular electromagnetic methods are presented on the basis of the obtained results and the knowledge of the lectures.
- Students make measurements about the wave nature of radiation - with particular regard to microwave radiation, discussion is made about the effects of this flow.
- During the laboratory, discussions about the obtained values ??of measured quantities - radiant power generated in individual sub - bands of optical radiation (UV - VIS - IR)
- The measurements taken during the measurements are compared with the presented data of the manufacturer and the results obtained by the employees of the Department.
- The effects of optical radiation (especially UV) on materials characterized by luminescence are demonstrated.
- Based on the knowledge of the lectures and the measurements taken, students determine the risks associated with blue radiation in LED lamps. at work places
- Experimental calculations of changes in luminous efficacy in cases other than directly investigated in laboratories - effects of changes in filament temperature, fluorescent fluorescence changes, etc.

Applied methods of education: lectures:

- lecture with multimedia presentation (including: drawings, photographs, animations, sound, films) supplemented by examples given on the board
- an interactive lecture with questions to a group of students or to specific students
- Student activity is taken into account during the final assessment
- during the lecture, initiating the discussion
- theory presented in close connection with practice
- theory presented in connection with current knowledge of students
- consideration of various aspects of the presented issues, including: economic ones

Applied methods of education: laboratories:

- laboratories supplemented with multimedia presentations (photos, animations, charts)
- use of tools to enable students to perform tasks at home (author software)
- computational experiments
- work in teams

Update 2017: Discussion and discussion on the introduction of white light-emitting diodes

Basic bibliography:

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 on the website lumen.iee.put.poznan.pl

Additional bibliography:		
1. Hering M.: Podstawy elektrotermii cz. I. WNT, Warszawa 1992		
2. Hering M.: Podstawy elektrotermii cz. II. WNT, Warszawa 1998		
Result of average student's workload		
Activity	Time (working hours)	
1. Participation in lectures	15	
2. Participation in laboratory classes	30	
3. Participation in consultations (lectures)	2	
4. Participation in consultations (laboratory classes)	5	
5. preparation for laboratory classes (home activities)	15	
6. preparation reports to laboratory classes (homework)	10	
7. preparation for the exam	10	
8. participation in the final exam	2	
Student's workload		
Source of workload	hours	ECTS
Total workload	89	3
Contact hours	54	2
Practical activities	55	2