COURSE DESCRIPTION CARD - SYLLABUS

Course name
Thermal imaging diagnostics [N2Eltech2-ISP>DT]

Course

Field of study
Electrical Engineering

Year/Semester
2/4

Area of study (specialization)
Smart Measurement Systems

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
0

Projects/seminars
0

Number of credit points

1,00

Coordinators

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Lecturers

Prerequisites

The student should know the basic knowledge of electrical engineering, metrology, computer science and electronics.

Course objective

Understanding the basics of thermovision phenomena, familiarization with modern measurement techniques and awareness of the need to use modern measurement systems working as an IoT node in Industry 4.0 applications in terms of thermovision measurements.

Course-related learning outcomes

Knowledge:
1. Has knowledge of development trends, new achievements and dilemmas of modern engineering.
2. Has extended knowledge in the field of measurements of electrical quantities and selected non-electrical quantities; has in-depth knowledge of the development of the results of the experiment.

Skills:
1. Can obtain information from literature, databases and other sources, make their interpretation,

evaluation, critical analysis and synthesis, as well as draw conclusions and formulate and exhaustively justify opinions.
2. Can assess the usefulness and the possibility of using new technical and technological achievements for the design and manufacture of electrical systems and devices containing innovative solutions, and if necessary, propose their improvements.

Social competences:
1. Recognizes the importance of knowledge in solving cognitive and practical problems and understands that in technology, knowledge and skills quickly become obsolete and therefore require constant replenishment.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Assessment of the knowledge demonstrated in the written or oral test on the content of the lectures at the last lecture. Passing threshold: 50% of points. Rewarding presence, activity and quality of perception during the lecture.

Programme content

Lecture:
The issues presented during the lecture include the physical phenomena underlying the thermal imaging technique and the presentation of factors affecting the accuracy of thermal imaging measurements. Practical aspects of thermal imaging temperature measurements will also be presented.

Course topics

Lecture:
Theoretical issues presented in close connection with practice include:
- physical phenomena underlying the thermal imaging technique,
- construction of modern thermal imaging cameras,
- factors affecting the result of thermographic temperature measurement,
- thermal imaging camera processing equation,
- selected parameters of thermal imaging cameras (NEDT, IFOV, FOV),
- practical aspects of thermographic temperature measurements,
- thermovision measurement systems as an IoT node in Industry 4.0 applications.

Teaching methods

Lecture: Multimedia presentations supplemented with examples given on the blackboard.

Bibliography

Basic:
1. Bogusław Więcek, Gilbert De Mey: Termowizja w podczerwieni: podstawy i zastosowania. Wydawnictwo PAK, 2011.
2. Krzysztof Dziarski, Arkadiusz Hulewicz, Grzegorz Dombek, Ryszard Frąckowiak, Grzegorz Wiczyński: Unsharpness of Thermograms in Thermography Diagnostics of Electronic Elements, Sensors, 2020.
3. Krzysztof Dziarski, Arkadiusz Hulewicz, Grzegorz Dombek: Indirect Thermographic Temperature Measurement of a Power-Rectifying Diode Die, Energis, 2021.
4. Arkadiusz Hulewicz, Krzysztof Dziarski, Grzegorz Dombek: The Solution for the Thermographic Measurement of the Temperature of a Small Object, Sensors, 2021.
5. Krzysztof Dziarski, Arkadiusz Hulewicz, Grzegorz Dombek: Thermographic Measurement of the Temperature of Reactive Power Compensation Capacitors, Energis, 2021.

Additional:
1 Infrared Thermography: Errors and Uncertainties. Waldemar Minkina, Wiley-Blackwel, I 2009.
2. Standards: JESD 51-4A, JESD 51-12.01, JESD 51-13, JESD 51-14, JESD 51-32, JESD 51-50, JESD 51-51,
JESD 51-52, JESD 51-53

Breakdown of average student's workload

	Hours	ECTS
Total workload	25	1,00
Classes requiring direct contact with the teacher	10	0,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	15	0,50