COURSE DESCRIPTION CARD - SYLLABUS

Course name
Physics of Dielectrics

Course

Field of study
Technical Physics

Year/Semester
1/1

Area of study (specialization)

Profile of study
general academic

Level of study
Second-cycle studies

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

2

Lecturers

Responsible for the course/lecturer:
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Wydział Inżynierii Materiałowej i Fizyki Technicznej

ul. Piotrowo 3 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

Knowledge of the science of electricity and condensed phase physics in the scope of the curriculum content of the subjects at the 1st degree of education in the field of Technical Physics. The ability to solve elementary problems in electricity based on the acquired knowledge, as well as obtain information from the indicated sources.

Course objective

Provide students with the knowledge of the theory and basic properties and applications of dielectrics.

Course-related learning outcomes

Knowledge

1. Knows the physical models used to describe dielectrics, and knows the limitations in the use of these models. - [K2_W01, K2_W02]

2. Has extensive knowledge of the characterization of dielectrics and their potential applications, knows the current state of knowledge on dielectric materials, knows the methods of dielectric testing, including the method of dielectric spectroscopy. - [K2_W04, K2_W10, K2_W13]

Skills

1. Can select dielectric materials for their applications in modern electronics and optoelectronics. - [K2_U13]

Social competences

1. Perceives the possibilities and ways of continuous updating and supplementing knowledge in the field of modern technology using dielectric materials. - [K2_K04]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning effect	Form of evaluation	Evaluation criteria	
W01, W02, W04, W10, W13	written/oral exam	3	50.1%-70.0%
		4	70.1%-90.0%
		5	od 90.1%
U013	written/oral exam	3	50.1%-70.0%
		4	70.1%-90.0%
		5	od 90.1%
K04	written/oral exam	3	50.1%-70.0%
		4	70.1%-90.0%
		5	od 90.1%

Programme content

1. Maxwell's theory as applied to dielectrics.

2. Dielectric in an electric field (electric permittivity, electric susceptibility, electric polarization).

3. Molecular description of dielectric polarization.

4. Local Lorentz field.

5. Local Onsager field.

6. Froehlich's theory of dielectrics.

7. Kirkwood's model.

5. Dielectric relaxation and its use.

6. Nonlinear effects in dielectrics.

7. Ferroelectrics, piezoelectrics, pyroelectrics and their applications.

8. Production, properties and application of electrets.

Teaching methods

Lecture: multimedia presentation, presentation illustrated with examples given on the board.

Bibliography

Basic

1. A. Chełkowski, Fizyka dielektryków, PWN, Warszawa, 1993

Additional

1. A.R. von Hippel, Dielektryki i fale, PWN, Warszawa, 1963

2. C.J.S. Boettcher, Theory of electric polarization, vol. 1 and 2, Elsevier, Amsterdam, 1978

3. B. Hilczer, J. Małecki, Elektrety i piezopolimery, PWN, Warszawa, 1992

Breakdown of average student's workload

	Hours	ECTS
Total workload	64	2,0
Classes requiring direct contact with the teacher	34	1,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	0	0,0

[1] delete or add other activities as appropriate