COURSE DESCRIPTION CARD - SYLLABUS

Course name

Functional organic structures

Course

Field of study

Education in Technology and Informatics

Year/Semester

1/2

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

elective

Number of hours

Lecture

30

Laboratory classes

0

Other (e.g. online)

0

Tutorials

0

Projects/seminars

0

Number of credit points

2

Lecturers

Responsible for the course/lecturer:

dr hab. Eryk Wolarz, prof. uczelni

Instytut Badań Materiałowych i Inżyneirii Kwantowej

Wydział Inżynierii Materiałowej i Fizyki Technicznej

ul. Piotrowo 3, 60-965 Poznań

eryk.wolarz@put.poznan.pl

Responsible for the course/lecturer:

Prerequisites

Knowledge of general physics, modern physics and quantum physics at the level of the courses at the first stage of education in the field of Education in Technology and Informatics at WIMiFT PP. Knowledge of mathematics in the field taught in the first stage of education of the above-mentioned studies.

Course objective

To acquaint students with selected topics related to the physics of organic materials used in functional organic structures (liquid crystal displays, organic light-emitting diodes).

Course-related learning outcomes

Knowledge

1. Has knowledge of the physics of organic materials used in functional organic structures, such as liquid crystal displays or organic light emitting diodes, as well as knowledge about the operation of these structures [K2_W01, K2_W03, K2_W14, K2_W15, K2_W16].

Skills

1. Has the ability to determine the basic parameters of selected functional organic structures (LCD, OLED, OPVC) for research and commercial purposes [K2_U08].

Social competences

1. Understands the need to formulate and transfer information and opinions on the achievements of technology to the society [K2_K07].

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning effect	Evaluation method	Evaluation criteria	
W01, W02, W03, W04, W10, W13	written / oral exam	3	50.1%-70.0%
		4	70.1%-90.0%
		5	od 90.1%
U05, 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. Electric and magnetic properties of organic molecules.

2. Interactions of organic molecules.

3. Molecular aggregation.

4. Spectral properties of molecular aggregates.

5. Classification and basic characteristics of functional organic structures.

6. Liquid crystals - classification and basic physical properties.

7. Orientation properties of nematic (N) and smectic (SmA) liquid crystals.

8. Determining the order parameters of nematics with the use of the "guest-host" effect.

9. Deformations of nematics in external electric and magnetic fields.

10. Dielectric relaxation of liquid crystals.

11. Liquid crystal displays (LCDs).

12. Molecular crystals as semiconductor materials.

13. Determination of molecular crystal structure by the Debye-Scherrer-Hull method.

14. Models of electric conductivity of organic materials.

15. Organic Light Emitting Diode (OLED), Organic Field Effect Transistor (OFET), Organic Photovoltaic Cell (OPVC).

Teaching methods

Lecture using multimedia and traditional methods (chalk and blackboard).

Bibliography

Basic

1. P.G. de Gennes, J. Prost, The Physics of Liquid Crystals, 2nd edition, Oxford University Press, 1993.

2. S. R. Forrest, Organic Electronics: Foundations to Applications, Oxford University Press, 2020.

Additional

1. S. Chandrasekhar, Liquid Crystals, 2nd edition, Cambridge University Press, 1992.

2. H. Singh Naiva (Ed.), Handbook of Organic Electronics and Photonics, Vol. 1-3, Journal of Nanoscience and Nanotechnology, 2008.

3. J. Godlewski, Wstęp do elektroniki molekularnej, Wydawnictwo Politechniki Gdańskiej, 2008.

4. Z. Kęcki, Podstawy spektroskopii molekularnej, Wydawnictwo Naukowe PWN, 1998.

5. A. S. Davydov, Theory of Molecular Excitons, Plenum Press, 1971.

6. Z. Bojarski, M. Gigla, K. Stróż, M. Surowiec, Krystalografia, wyd. 3 uaktualnione, Wydawnictwo Naukowe PWN, 2014.

Breakdown of average student's workload

	Hours	ECTS
Total workload	60	2,0
Classes requiring direct contact with the teacher	30	1,0
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