GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00046118		
Field of study	Technical Physics		
Date of commencement of studies	February 2024	Academic year of realisation of subject	2024/2025
Education level	second-cycle studies	Subject group	Optional subject group Subject group related to scientific research in the field of study
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	2	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Institute of Physics and Applied Computer Science -> Faculty of Applied Physics and Mathematics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr Piotr Weber	
	Teachers	dr Piotr Weber	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	0.0	0.0	0.0	0.0	30

E-learning hours included: 0.0

Learning activity and number of study hours

Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM
Number of study hours	30	4.0	16.0	50

Subject objectives

The aim of the course is to familiarize students with the description of typical systems classified as soft matter.Presentation of concepts and theories appropriate to describe the most important physicochemical properties of soft matter.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W02] Has enhanced, theoretically-founded, detailed knowledge of selected field of physics, and sufficient knowledge of related fields of science or technology.	He will give examples of systems belonging to soft matter and discuss its properties. He will know what models are used to describe this type of matter.	[SW3] Assessment of knowledge contained in written work and projects [SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge
[K7_W03] Has general knowledge of current development paths and discoveries in the scope of physics and related fields of science and technology.	The student will gain knowledge in the field of soft matter physics and its current directions of progress.	[SW3] Assessment of knowledge contained in written work and projects [SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge

Subject contents	The lecture concerns the microscopic, mesoscopic and macroscopic characteristics of soft matter systems. Typical systems classified as soft matter (colloids, polymers, amphiphilic systems, liquid crystals, emulsions) as well as processes and phenomena occurring in systems classified as soft matter will be presented. Intermolecular and structural interactions will be discussed. In particular, self-organization processes in soft matter will be discussed on the example of surface-active compounds, liquid crystals and block copolymers. The spatial arrangement of molecules in this type of systems and the hierarchical description of these systems will be discussed. The rheological properties of soft matter (concepts: viscosity, elasticity, viscoelasticity, relaxation times) and mechanical models used to describe viscoelasticity will be presented. With regard to colloidal systems, methods of obtaining colloidal systems and their stabilization will be presented; the role of the interfacial surface, the electrical double layer and the DVLO theory will be presented. In the case of polymers, selected models of the dynamics of polymer systems will be discussed (Rouse's model, Zimm's model, Doi-Edwards' model). Issues related to liquid crystals will be presented.
Prerequisites and co-requisites	

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
exam	50.0%	100.0%

Recommended reading

Basic literature	M. Kleman, O. D. Lavrentovich *Soft Matter Physics*, Springer, 2001 P. W. Atkins, *Physical Chemistry*, OUP Oxford, 2010
Supplementary literature	L. Piela *Ideas of Quantum Chemistry,* Elsevier, 2013
eResources addresses	Adresy na platformie eNauczanie: Fizyka materii miękkiej 2024/2025 - Moodle ID: 39027 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=39027

Example issues/ example questions/ tasks being completed	1. Discuss the structure of a polymer molecule (polymer and copolymer?). In relation to the molecule polymer, explain the terms: primary structure, secondary structure (conformation),three-dimensional structure and quaternary structure.2. Describe the measure of stiffness of a polymer chain - persistent length. 3. Explain the concept of polymer chain conformation and conformational entropy. Pass itformula for conformational entropy in the case of a one-dimensional ball.4. Explain the concept of a colloidal system. How do we divide colloidal systems? Introduce the typescolloidal systems with examples.5. Describe the packing parameter for creating supramolecular structures from moleculeshaving hydrophobic and hydrophilic parts (amphiphilic molecules).
Work placement	Not applicable

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