GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00046118		
Field of study	Technical Physics		
Date of commencement of studies	February 2023	Academic year of realisation of subject	2023/2024
Education level	second-cycle studies	Subject group	
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	Instytut Fizyki i Informatyki Stosowanej -> 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

To familiarize students with the physical description of typical systems that belong to soft matter systems. To familiarize students with the physico-chemical properties of: liquid crystals, polymers, emulsions and colloids.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[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 obtain knowledge in the field of soft matter physics and its current directions of development.	[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation
[K7_W02] Has enhanced, theoretically-founded, detailed knowledge of selected field of physics, and sufficient knowledge of related fields of science or technology.	The student will obtain knowledge in the field of soft matter physics. Give examples of this type of matter and discuss its properties. He will know what models are used to describe this type of matter.	[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation

Subject contents

The lecture consists of several thematic parts. The first part concerns the microscopic, mesoscopic and macroscopic characteristics of soft matter systems. The characteristics of the spatial arrangement of molecules in this type of systems are also discussed. In this thematic part, basic information on the structure of molecules is recalled, methods of describing intermolecular interactions are discussed, and a mesoscopic description is introduced. The relationships between selected thermodynamic quantities appearing in the description of soft matter, including phase transitions and self-organization, are also discussed.The following sections discuss:

- processes occurring in colloidal systems; methods of obtaining colloidal systems and their stabilization; the role of the interfacial surface, the electrical double layer and the DVLO theory.
- selected models of the dynamics of polymer systems (elasticity of a single polymer molecule, Rouse model, Zimm model, Doi-Edwards theory);
- physico-chemical characteristics of polymer solutions. issues related to liquid crystals.

Prerequisites and co-requisites

<table>
<tr><td>Assessment methods and criteria</td><td colspan="2"><table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td>exam</td><td>50.0%</td><td>100.0%</td></tr></table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>M. Kleman, O. D. Lavrentovich Soft Matter Physics, Springer, 2001

P. W. Atkins, Physical Chemistry, OUP Oxford, 2010</td></tr>
<tr><td>Supplementary literature</td><td>L. Piela Ideas of Quantum Chemistry, Elsevier, 2013</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:
Fizyka materii miękkiej 2023/2024 - Moodle ID: 34407
https://enauczanie.pg.edu.pl/moodle/course/view.php?id=34407</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">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).</td></tr>
<tr><td>Work placement</td><td colspan="2">Not applicable</td></tr>
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