GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Modern supramolecular chemistry, PG_00069292		
Field of study	Chemistry		
Date of commencement of studies	February 2026	Academic year of realisation of subject	2026/2027
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	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Chemistry and Technology of Functional Materials -> Faculty of Chemistry -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Ewa Wagner-Wysiecka	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	15.0	0.0	15.0	45

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	45	5.0	25.0	75

Subject objectives

The aim of the course is to introduce students to the fundamentals of supramolecular chemistry and its applications in science, medicine, and technology. The course content illustrates the dynamic development of supramolecular chemistry from the first macrocyclic compounds to modern molecular machines.

Learning outcomes

Course outcome	Subject outcome	Method of verification

Subject contents

Course content – lecture

Lecture: 15 hours

Historical aspects of the development of supramolecular chemistry. Fundamental concepts and definitions in supramolecular chemistry. Terms: ligand, substrate, receptor, host, guest. Types of interactions in supramolecular structures and methods for studying hostguest interactions. Pearsons Hard and Soft Acids and Bases (HSAB) theory. Naturally occurring supramolecular systems and their roles. Synthetic complexing agents: podands, crown ethers, cryptands, spherands, calixarenes, hetero- and homo-calixarenes, metalloporphyrins, and others. Strategies for the synthesis and preparation of supramolecular systems, including macrocyclic compounds (template effect, preorganization, dilution method, high-pressure method). Structure of selected supramolecular systems and the selectivity of interactions. Applications of supramolecular systems in science and technology and their connections to other disciplines (nanotechnology, medicine, pharmacy, environmental protection). Molecular machines.

Course content – laboratory

Laboratory: 15 hours

1. Adsorptive properties of MOF-type networks case study: KOH/β-cyclodextrin system
2. Synthesis and characterization of quantum dots
3. Synthesis of urea and thiourea clathrates; investigation of their physicochemical properties
4. Optodes optical sensors supramolecular approach
5. Supramolecular complexes of organic compounds with cyclodextrins

Course content – seminar

Seminar: 15 hours

The seminar is conducted in the form of Oxford-style debates and student presentations. The topics reflect issues, questions, and inspirations arising from lectures and laboratory classes, as well as attempts to critically verify popular beliefs and myths present in the public discourse. Students have a real influence on the selection of topics discussed during the seminar sessions.

<table>
<tr><td>Prerequisites and co-requisites</td><td colspan="3">Familiarity with topics covered in core courses: organic chemistry, inorganic chemistry, and physical chemistry.</td></tr>
<tr><td>Assessment methods and criteria</td><td colspan="3"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Lecture – written test</td><td>51.0%</td><td>40.0%</td></tr>
<tr><td>Seminar – active participation in Oxford-style debate</td><td>51.0%</td><td>30.0%</td></tr>
<tr><td>Laboratory – completion of all practical exercises; passing written tests (short in-class tests)</td><td>51.0%</td><td>30.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">1. Jonathan W. Steed, David R. Turner, Karl Wallace: "Core Concepts in Supramolecular Chemistry and Nanochemistry", Willey 2009

2. Katsuhiko Ariga, Toyoki Kunitake: "Supramolecular Chemistry - Fundamentals and Applications: Advanced Textbook", Springer Science & Business Media, 2006

3. Wybrane aspekty chemii supramolekularnej, Praca zbiorowa pod redakcją Grzegorza Schroedera, BETAGRAF P.U.H. Poznań 2009

4. Kompleksy typu gość-gospodarz. red. Grzegorz Schroeder, SERIA: Chemia Supramolekularna, BETAGRAF Poznań, 2003

5. H. Dodziuk, Wstęp do chemii supramolekularnej, Wydawnictwo Uniwersytetu Warszawskiego, 2018

6. Materiały do ćwiczeń laboratoryjnych</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">J. W. Steed, J. L. Atwood, Supramolecular Chemistry, 3rd Edition, Wiley, 2022</td></tr>
<tr><td>eResources addresses</td><td colspan="2"></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3">Discuss the relationship between the structure of crown ethers and their selectivity toward metal cations.

Challenges in anion coordination chemistry.

Discuss the synthetic strategy for macrocyclic compounds.

Provide examples of molecular machines inspired by nature.</td></tr>
<tr><td>Practical activites within the subject</td><td colspan="3">Not applicable</td></tr>
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