GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Modern supramolecular chemistry , PG_00072663						
Field of study	Chemical Technology, Chemistry, Biotechnology, Engineering and Technologies of Energy Carriers, Corrosion , Green Technologies, InfoBioChem						
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	English			
Semester of study	2		ECTS credits	2.0			
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	0.0	0.0	15.0	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 acquaint students with 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 contemporary molecular machines.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W101] is able to make an in-depth identification of key objects and phenomena related to the field of study, as well as theories that describe them and applicable analytical and design methods	identifies and describes key objects and phenomena in supramolecular chemistry, including ligands, receptors, substrates, host–guest systems, non-covalent interactions, supramolecular systems occurring in nature, synthetic receptors and molecular machines. The student understands the fundamentals of supramolecular system design and their significance in contemporary chemistry.	[SW1] Assessment of factual knowledge
[K7_W04] indicates methods for the synthesis of chemical compounds with defined properties	knows and is able to indicate strategies for the preparation of selected supramolecular systems, in particular macrocyclic compounds, taking into account the template effect, preorganisation, high-dilution method and other methods leading to compounds with defined complexing properties.	[SW1] Assessment of factual knowledge
[K7_U04] develops and transmits technical information in the form of text documents, spreadsheets, graphs, technological diagrams and multimedia presentations, and prepares a speech including a multimedia presentation	is able to prepare and present a selected topic in supramolecular chemistry in the form of an oral presentation and a multimedia presentation, using appropriate chemical terminology and presenting scientific arguments in a logical manner.	[SU3] Assessment of ability to use knowledge gained from the subject [SU5] Assessment of ability to present the results of task
[K7_W01] recognizes problems of modern chemistry, including properties and obtaining chemical compounds, necessary for making calculations, including the dependence of the compound's structure and its reactivity	knows and understands fundamental and contemporary problems of supramolecular chemistry, including the relationship between the structure of ligands, receptors and macrocyclic systems and their properties, selectivity and ability to form host–guest complexes.	[SW1] Assessment of factual knowledge
[K7_U01] integrates and interprets information from literature, databases and other sources	is able to search for, integrate and interpret information related to supramolecular chemistry, in particular in the area of supramolecular interactions, host–guest systems, macrocyclic compounds and contemporary applications of supramolecular chemistry in science, medicine, technology and environmental protection.	[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools

Subject contents

Course content – lecture

Historical aspects of the development of supramolecular chemistry. Basic concepts and definitions in supramolecular chemistry. Concepts: ligand, substrate, receptor, host, guest. Types of interactions in supramolecular structures and methods for studying host–guest interactions. Pearson's hard and soft acids and bases theory. Supramolecular systems occurring in nature and their role. Synthetic complexing agents (podands, coronands, 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 selectivity of interactions. Supramolecular systems in science and technology and their links with other fields (nanotechnology, medicine, pharmacy, environmental protection). Molecular machines.

Course content – seminar

Seminar conducted in the form of Oxford-style debates and student presentations. The topics will reflect problems/questions/inspirations arising during the lectures, as well as attempts to verify popular beliefs and myths present in the public sphere. Students have a real influence on the choice of issues discussed during the seminar.

Prerequisites and co-requisites

Knowledge of topics covered in the following core courses: organic chemistry, inorganic chemistry, and physical chemistry.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Lecture – written examination	51.0%	55.0%
Seminar – active participation in Oxford-style debate	51.0%	45.0%

Recommended reading	Basic literature	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
	Supplementary literature	J. W. Steed, J. L. Atwood, Supramolecular Chemistry, 3rd Edition, Wiley, 2022
	eResources addresses	
Example issues/ example questions/ tasks being completed	• Discuss the relationship between the structure of crown ethers and their selectivity toward metal cations. • Challenges of anion coordination chemistry. • Discuss the strategy for the synthesis of macrocyclic compounds. • Provide examples of molecular machines inspired by nature.	
Practical activites within the subject	Not applicable	

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