

Subject card

Subject name and code	Integrated approaches to cosmetic bioactives: molecular design, sustainability and industrial translation, PG_00197341						
Field of study	Chemical Business, Chemistry, Environmental Protection						
Date of commencement of studies	October 2026		Academic year of realisation of subject		2028/2029		
Education level	Bachelor's studies		Subject group		Obligatory subject group in the field of study Optional subject group		
Mode of study	full-time studies		Mode of delivery		at the university		
Year of study	3		Language of instruction		English		
Semester of study	6		ECTS credits		2.0		
Learning profile	academic		Assessment form		credit		
Conducting unit	Faculty of Chemistry -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr Aleksandra Walewska				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	0.0	0.0	15
	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	15		10.0		25.0	50
Subject objectives	</						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[CHEML3_U08] Presents in an understandable way the basic facts about chemistry using a scientific language typical of chemical sciences.	The student formulates and presents chemical concepts in a clear and precise manner, using terminology and a style appropriate for the chemical sciences.	[SU1] oral statement/conversation/discussion [SU5] implementation of a problem task
	[CHEML3_W03] Explains the relationship between the structure of matter and its observed properties.	The student explains at an advanced level the relationships between the molecular structure of bioactive ingredients and their physicochemical properties, biological activity, and functionality in cosmetic formulations	[SW1] oral statement/conversation/discussion [SW5] implementation of a problem task
	[CHEML3_W04] Characterises the basic methods of chemical compound analysis.	The student characterizes methods for the analysis and evaluation of bioactive ingredients used in cosmetology, including techniques for determining their structure, purity, stability, and biological activity.	[SW1] oral statement/conversation/discussion [SW5] implementation of a problem task
	[CHEML3_U01] Identifies, analyses and solves problems in the field of broadly understood chemistry on the basis of the acquired knowledge.	The student identifies, analyzes, and solves problems related to the design, property evaluation, and implementation of bioactive ingredients in the cosmetic industry, based on interdisciplinary chemical knowledge and the principles of rational molecular design.	[SU1] oral statement/conversation/discussion [SU5] implementation of a problem task
	[CHEML3_U12] Reads with understanding scientific and popular science chemical texts in English.	The student is able to read and analyze professional literature concerning the molecular design, sustainability, and industrial development of cosmetic bioactive ingredients. The student understands specialized scientific articles, research reports, and industry publications related to innovative bioactives, their mechanisms of action, formulation challenges, and implementation in cosmetic products.	[SU1] oral statement/conversation/discussion [SU5] implementation of a problem task
Subject contents	The course covers an integrated approach to the design and implementation of bioactive ingredients in the cosmetic industry, with particular emphasis on the relationships between molecular structure, physicochemical properties, and biological activity. It addresses the principles of rational compound design, factors influencing bioavailability and stability, and their functionality in cosmetic formulations. The course also includes issues related to sustainability in the design and production of bioactive ingredients, including the application of biotechnology and the principles of green chemistry. Aspects of efficacy and safety assessment, as well as selected topics related to industrial implementation and regulatory requirements, are also discussed.		
Prerequisites and co-requisites	Fundamentals of Organic Chemistry and Biochemistry		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	The condition for passing the course is active participation in classes and obtaining a positive grade on the final test	51.0%	100.0%
Recommended reading	Basic literature	1. Introduction to Cosmetic Formulation and Technology, Gabriela Baki, 2nd Edition, 2023 2. Cosmetic Science and Technology, Theoretical Principles and Applications, Kazutami Sakamoto et al, Elsevier, 2017	
	Supplementary literature	Articles from scientific journals: International Journal of Cosmetic Science, Journal of Cosmetic Dermatology, Cosmetics, European Journal of Pharmaceutics and Biopharmaceutics, Natural Product Reports, Biotechnology Advances,	

	eResources addresses	
Example issues/ example questions/ tasks being completed	1. Explain how the molecular structure of a bioactive ingredient influences its bioavailability, stability, and efficacy in a cosmetic formulation. 2. Analyze a selected bioactive ingredient in terms of structureactivity relationships (SAR) and propose possible modifications to improve its stability or effectiveness. 3. Discuss the factors that must be considered when transitioning from the molecular concept of a bioactive ingredient to its industrial implementation. 4. Propose a strategy for designing a cosmetic bioactive ingredient in accordance with the principles of green chemistry and sustainable development.	
Work placement	Not applicable	

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