University of Gdańsk

Subject card

Subject name and code	From nano-concept to cosmetic product, PG_00183757		
Field of study	Od nano-pomysłu do produktu kosmetycznego (Ćw. laboratoryjne)		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2026/2027
Education level	Master'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	1	Language of instruction	Polish polish
Semester of study	2	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 inż. Anna Malankowska	
	Teachers		

Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	30.0	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 interdisciplinary aspects of designing and developing modern cosmetic products that utilize nanotechnology. Students will acquire skills in identifying and characterizing nanomaterials used in cosmetics, learn methods for producing organic nanocarriers of active substances, and gain practical experience in formulating, synthesizing, and evaluating their own cosmetic products. The course promotes creativity, project-based and teamwork skills, as well as a critical understanding of the use of nanomaterials in cosmetic formulations.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[CHEMMU2_W03] Demonstrates extended knowledge in the field of modern measuring techniques used in chemical analysis.	The student knows and understands the principles of modern analytical techniques used in the examination and evaluation of cosmetic product ingredients.	[SW1] wypowiedź ustna/rozmowa/ dyskusja [SW5] realizacja zadania problemowego
[CHEMMU2_K02] Is able to undertake a variety of roles in the team, including supervisory ones.	The student is able to cooperate effectively within a team, demonstrating responsibility for achieving common goals and readiness to take on various roles, including that of a leader.	[SK2] prezentacja/projekt/referat/ raport
[CHEMMU2_U05] Presents the results of research in the form of an independently written paper containing a description and justification of the purpose of the work, adopted methodology, results and their significance in comparison to other similar research.	The student is able to develop and present research results in a report including the objective, methodology, results, and their interpretation. The student knows the principles of writing and presenting scientific papers.	[SU2] prezentacja/projekt/referat/ raport
[CHEMMU2_U01] Plans and implements chemical experiments of medium complexity.	The student is able to independently plan, conduct, and document a chemically complex experiment, selecting appropriate research methods and tools.	[SU5] realizacja zadania problemowego
[CHEMMU2_U02] Critically assesses the results of conducted, performed observations and theoretical calculations and discusses errors.	The student is able to interpret the obtained data and draw conclusions, taking into account measurement uncertainties and methodological limitations.	[SU2] prezentacja/projekt/referat/ raport
[CHEMMU2_W12] Knows the principles of occupational health and safety to the extent that allows independent work on a research and/or measurement position.	The student knows the principles of safety and hygiene applicable in the chemical laboratory and is able to apply them in practice.	[SW5] realizacja zadania problemowego

Subject contents

Introduction to nanotechnology in cosmetics types and applications of nanomaterials; safety aspects and legal regulations.

Identification and characterization of nanomaterials analytical methods (UV-Vis, FTIR, XRD, SEM/TEM, DLS); analysis of the presence of TiO, ZnO, Ag, and Au in cosmetic products.

Production of organic nanocarriers liposomes, niosomes, dendrimers; synthesis methods, surface functionalization, and evaluation of system stability.

Design of cosmetic formulations selection of oil and water phases, active ingredients, emulsifiers, and preservatives; influence of nanomaterials on product properties and effectiveness.

Production technologies and evaluation of cosmetic products formulation of emulsions, gels, tonics, and serums; measurements of pH, viscosity, and stability, as well as sensory evaluation of products.

Presentation of laboratory projects.

Prerequisites and co-requisites

Knowledge of the principles of general, inorganic, organic, and analytical chemistry.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Project presentation	51.0%	100.0%

Recommended reading

Basic literature	1. Marzec, A. *Chemistry of Cosmetics.* Dom Organizatora TNOiK, Toruń, 2009. 2. Sarbak, Z., Jachymska-Sarbak, B., Sarbak, A. *Chemistry in Cosmetics and Cosmetology*. MedPharm Polska, Wrocław, 2013. 3. Glinka, W., Brud, T. *Cosmetic Technology.* MA Publishing House, Łódź, 2003.
Supplementary literature	Scientific publications recommended by the lecturer
eResources addresses	

Example issues/ example questions/ tasks being completed	Laboratory classes provide practical experience in the stages of designing, producing, and analyzing modern cosmetic products that incorporate nanotechnology. Students become familiar with methods for identifying nanomaterials in cosmetic formulations, with particular emphasis on TiO, ZnO, Ag, Au and the instrumental techniques used for their characterization. The next part of the course focuses on the production of organic nanocarriers (liposomes, niosomes, dendrimers), covering issues such as generational growth, surface functionalization, and optimization of process parameters. Methods for assessing the stability of nanocarrier systems and their application potential in cosmetology are also discussed. In the following section, students learn the principles of cosmetic formulation design, including the selection of oil and water phases, emulsifiers, preservatives, and active substances, while considering chemical compatibility and the influence of nanomaterial properties on product functionality and skin penetration. During the laboratory project, participants select an appropriate production technology for a specific type of product (O/W or W/O emulsions, gels, serums, tonics), and then develop and prepare their own cosmetic formulations based on their designed concept. In the practical part, students learn mixing, homogenization, and preservation techniques, as well as perform measurements of pH, viscosity, and product stability. They also evaluate the sensory properties (color, fragrance, consistency) of the obtained formulations and present their results in a final presentation.
Work placement	Not applicable

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