GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	LIPID CHEMISTRY AND TECHNOLOGY, PG_00064321		
Field of study	Chemical Technology		
Date of commencement of studies	February 2027	Academic year of realisation of subject	2026/2027
Education level	second-cycle studies	Subject group	Optional subject group Specialty subject group
Mode of study	Full-time studies	Mode of delivery	blended-learning
Year of study	1	Language of instruction	Polish
Semester of study	1	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Biotechnology and Microbiology -> Faculty of Chemistry -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Adam Macierzanka	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	15.0	0.0	0.0	30

E-learning hours included: 15.0

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	5.0	25.0	60

Subject objectives

The aim of the course is to provide an understanding of the chemistry and technology of lipid substances relevant to the cosmetics industry. As part of the course, the student gains knowledge of the structure and properties of lipids, as well as their occurrence, extraction, and processing for industrial purposes. The student becomes familiar with technological processes and the physicochemical transformations that lipids undergo. The course also covers methods of lipid modification and the fundamentals of analysing lipid fractions, both in raw materials and in cosmetic products.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_K01] critically evaluates the content of cognitive and practical problems	demonstrates responsibility and reliability in using the methods learned to describe and explain chemical and physical phenomena and technological processes, being aware of the consequences of their professional and social actions.	[SK5] Assessment of ability to solve problems that arise in practice
[K7_U05] uses instrumental methods applied in technology and related fields	is able to practically apply knowledge related to the selection and use of instrumental methods in lipid technology and is proficient in using basic techniques for analysing the properties of lipids.	[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment
[K7_W03] selects methods of data analysis, including statistical and modelling, useful for solving scientific and technological problems	knows and is able to apply appropriate methods for analysing data obtained in relation to lipid substances. They are capable of using the results of such analyses to solve scientific or technological problems.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge

Subject contents	Course content – lecture The course will cover both practical (technological) and theoretical aspects of lipid chemistry, along with an overview of measurement methodologies relevant to this field, as applied in the cosmetics industry and in applied scientific research concerning lipid chemistry. The subject matter of the course will include: 1. Lipids their classification, structure, and properties. 2. Fatty acids structure and occurrence. 3. Structure of natural triacylglycerols and other simple lipids. 4. Complex lipids. 5. Glycerophospholipids, glycosphingolipids, sterols, waxes, tocopherols, and fat-soluble vitamins. 6. Chemical reactions of fats and fatty acids. 7. Esterification and interesterification; transesterification. 8. Fat hydrolysis (cleavage), industrial production of fatty acids and their derivatives, soap production. 9. Methods for fractionating fatty acids. 10. Fat hydrogenation mechanism, catalysts, selectivity. 11. Fat oxidation pro-oxidants and antioxidants. 12. Thermal and thermo-oxidative transformations of fats and fatty acids. 13. Prevention of undesirable physicochemical transformations of lipids. 14. Instrumental analysis of lipid raw materials and lipid fractions in cosmetic products containing lipid substances. Course content – laboratory Laboratory classes focus on the practical consolidation of the topics presented during lectures. The laboratory classes include, among other things, the determination of characteristic values describing the properties of lipid substances used as cosmetic raw materials, the analysis of the progress of fat oxidation processes in model cosmetic products, and the evaluation of the effectiveness of antioxidants, etc.
Prerequisites and co-requisites	A general knowledge of the fundamentals of organic, analytical, and physical chemistry, as well as chemical technology and biotechnology.
Assessment methods and criteria	

Subject passing criteria	Passing threshold	Percentage of the final grade
Lectures - written assessment	50.0%	60.0%
Laboratory exercises – tests and reports on completed laboratory exercises	100.0%	40.0%

Recommended reading	Basic literature	1. Physical Properties of Lipids, ed. A. G. Marangoni, S.S. Narine, Marcel Dekker, Inc., New York, 2002. 2. Casimir C. Akoh, ed., Food Lipids: Chemistry, Nutrition, and Biotechnology, Fourth Edition, CRC Press, 2017. 3. B. Drozdowski, Lipidy, w: Chemiczne i funkcjonalne właściwości składników żywności, WNT, Warszawa,1994. 4. F. Gunstone, F. Padley, Lipid Technologies and Applications, Marcel Dekker Inc., New York, 1997. 5. E. Board, Hand Book Of Oils, Fats And Derivatives With Refining And Packaging Technology, Engineers India Research Institute, 2009. ***Current review articles in scientific journals.***
	Supplementary literature	Food Emulsifiers and Their Applications, ed. G.L.Hasenhuettl, R.W. Hartel, Chapman&hall, New York, 1997 G. Schramm, Reologia podstawy i zastosowania, OWN, Poznań 1998.
	eResources addresses	
Example issues/ example questions/ tasks being completed	• Determination of the physical and chemical properties of lipid substances obtained under industrial conditions. Extraction of oil from a selected fat-based raw material and comparison of the properties of the obtained oil with those of commercially available oils. • Study of the transformations occurring in fats as a result of thermal processing. Use of accelerated tests to assess the degree of lipid oxidation. Determination of the induction period of thermo-oxidation. • Synthesis of fatty acid esters investigation of reaction kinetics and analysis of the resulting products.	
Practical activites within the subject	Not applicable	

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