University of Gdańsk

Subject card

Subject name and code	Cosmeceuticals and nutraceuticals - laboratory classes, PG_00192678		
Field of study	Marine Biotechnology		
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 Subject group related to scientific research in the field of study
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	academic	Assessment form	credit
Conducting unit	Laboratory of Physical Biochemistry -> UG Institute of Biotechnology -> Intercollegiate Faculty of Biotechnology UG-MUG -> Rector		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. Bogdan Banecki	
	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	2.0	18.0	50

Subject objectives

The aim of the classes is to familiarize students with the practical aspects of marine biotechnology and methods used in laboratories to develop dietary supplements and medicinal products. Students learn about biotechnological processes, analytical techniques, and acquire skills necessary for laboratory work. The classes include obtaining and using active substances from marine organisms in the pharmaceutical and cosmetics industries. The emphasis is on teamwork and individual planning of experiments and contact with modern equipment.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[MBMU2-KW02] Has an in-depth knowledge of the possibilities of biotechnological use of marine resources	Demonstrates in-depth knowledge of the potential and various methods for the biotechnological utilization of marine resources, taking into account innovative solutions and the latest research trends.	[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion [SW2] presentation/project/paper/ report
[MBMU2-KU03] Can use and critically analyze available scientific information; can prepare and present - orally or in writing - a paper covering detailed problems in the field of marine biotechnology on the basis of the scientific information or their own work, with the use of scientific language, including specialized terminology and conceptual apparatus; has the ability to conduct discussions	Is capable of independently searching for, critically evaluating, and interpreting various scientific sources, and subsequently preparing and presenting (orally or in writing) a study on selected aspects of marine biotechnology, using specialized terminology and scientific argumentation. Also possesses the ability to conduct a substantive discussion grounded in the gathered data.	[SU2] presentation/project/paper/ report [SU8] observation of student's independent or team work

Subject contents

These exercises are intended to familiarize students with the process of creating medicinal or cosmetic products using the potential of marine organisms, from the design stage, development of analytical methods, through formulation development, method validation, to quality control of finished products:

- Extraction of oil from chlorella and spirulina. Quality control of oil.
- Extraction of a natural active compound of marine origin (fucoxanthin) from *Fucus vesiculosus*
- Determining the release profiles of active pharmaceutical ingredients (APIs) of marine origin from tablets
- Formulation and permeation study of red algae extract gels using franz cell diffusion testing
- Validation of measurement apparatus and equipment
- Determination of collagen content in cosmetics and nutraceuticals commercially available

Prerequisites and co-requisites

Knowledge of the basics of operation of biophysical equipment: UV VIS spectrometer, gas and liquid chromatograph, mass spectrometry. Knowledge of basic processes of molecular biology, biotechnology, microbiology. Ability to operate laboratory equipment.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
entry tests	51.0%	25.0%
practical implementation of the experiment	51.0%	50.0%
reports	51.0%	25.0%

Recommended reading

Basic literature

1. *Importance of algae oil as a source of biodiesel;* A. Demirbas, M. F. Demirbas; Energy Conversion and Management, 2011, 52(1): 163-170, 10.1016/j.enconman.2010.06.055
2. *Lipid and morphological changes in developing rapeseed, brassica napus*; D. B. Fowler, R. K. Downey; Canadian journal of plant science, 1970, 50(3): 233-247, 10.4141/cjps70-047
3. *The effect of temperature on the oil content and fatty acid composition of the oils from several oil seed crops*; David T. Canvin; Canadian journal of botany, 1965, 43(1): 63-69, 10.1139/b65-008
4. *Novel Separation Techniques for Isolation and Purification of Fatty Acids and Oil By-Products*; Udaya N. Wanasundara1, P. K. J. P. D. Wanasundara, Fereidoon Shahidi; Published Online: 15 JUL 2005; DOI: 10.1002/047167849X.bio065
5. Colin Poole & Michael Cooke, 2000, Extraction, in Encyclopedia of Separation Science, 10 Vols., ISBN 9780122267703
6. *A Rapid Method for the Determination of Fucoxanthin in Diatom.* L. J. Wang,, Y. Fan, R. L. Parsons, G.R. Hu, P.Y. Zhang, F.L. Li; Mar Drugs*, 2018,* 22;16(1):33, 10.3390/md16010033
7. *The Biochemical Composition and Antioxidant Properties of Fucus vesiculosus from the Arctic Region.* E. D. Obluchinskaya, O. N. Pozharitskaya, D.V. Zakharov, E.V. Flisyuk, I. I. Terninko, Y. E. Generalova, I. E. Smekhova, A. N. Shikov; Marine Drugs, 2022; 20(3):193, 10.3390/md20030193
8. FDA Guidance for Industry: Documents such as "Dissolution Testing of Immediate Release Solid Oral Dosage Forms" provide regulatory perspectives and standardized methodologies, which can be very instructive for students.
9. USP-NF and EP Monographs: The United States Pharmacopeia and European Pharmacopeia contains standardized methods and specifications for drug substances, including detailed procedures for dissolution testing and other analytical techniques.
10. Percutaneous Absorption: Drugs, Cosmetics, Mechanisms, Methods" by Robert L. Bronaugh and Howard I. Maibach

Supplementary literature

1. "Topical Drug Bioavailability, Bioequivalence, and Penetration" by Vinod P. Shah, Howard I. Maibach
2. "Pharmaceutical Skin Penetration Enhancement" edited by Kenneth A. Walters and Jonathan Hadgraft
3. "Skin Barrier: Chemistry of Skin Delivery Systems" by Johann Wiechers
4. "Methods for Skin Absorption" by William G. Reifenrath
5. Recent research articles from journals such as the Journal of Controlled Release, International Journal of Pharmaceutics, and European Journal of Pharmaceutics and Biopharmaceutics
6. "Fundamentals and Applications of Controlled Release Drug Delivery" by Juergen Siepmann, Ronald A. Siegel, Michael J. Rathbone

eResources addresses

Example issues/ example questions/ tasks being completed

Work placement

Not applicable

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