


**KAPITAŁ LUDZKI**  
 NARODOWA STRATEGIA SPÓJNOŚCI

 Projekt współfinansowany przez  
 Unię Europejską w ramach  
 Europejskiego Funduszu  
 Społecznego

**UNIA EUROPEJSKA**  
 EUROPEJSKI  
 FUNDUSZ SPOŁECZNY


<b>Course title</b>		<b>ECTS code</b>	
Biotechnology		13.3.0414	
<b>Name of unit administrating study</b>			
University of Gdańsk			
<b>Studies</b>			
<b>faculty</b>	<b>field of study</b>	<b>type</b>	pierwszego stopnia
Wydział Chemii	Chemia	<b>form</b>	stacjonarne
		<b>specjalty</b>	chemia biomedyczna, chemia kosmetyków
		<b>specialization</b>	wszystkie
<b>Teaching staff</b>			
prof. dr hab. Bogdan Banecki; dr Leszek Kadziński; dr Wojciech Śledź			
<b>Forms of classes, the realization and number of hours</b>		<b>ECTS credits</b>	
<b>Forms of classes</b>		5	
Laboratory classes, Lecture		classes - 60 h	
<b>The realization of activities</b>		tutorial classes – 10 h	
classroom instruction		student's own work – 55 h	
<b>Number of hours</b>		Total: 125 h - 5 ECTS	
Lecture: 30 hours, Laboratory classes: 30 hours			
<b>The academic cycle</b>			
2024/2025 summer semester			
<b>Type of course</b>		<b>Language of instruction</b>	
obligatory		polish	
<b>Teaching methods</b>		<b>Form and method of assessment and basic criteria for evaluation or examination requirements</b>	
- conducting experiments		<b>Final evaluation</b>	
- multimedia-based lecture		- Graded credit	
		- Examination	
		<b>Assessment methods</b>	
		- written exam with open questions	
		- (mid-term / end-term) test	
		- Written exam with open questions, Oral exam (supplementary), Mid-term tests	
		<b>The basic criteria for evaluation</b>	

In the case of lectures, the knowledge indicated in the syllabus is evaluated in the "Program contents" field. The standard for passing is the percentage indicator included in the Regulations of the University of Gdańsk.

In the case of laboratory exercises, the form of crediting is the correct conduct of research tasks indicated in the syllabus in the field "Program content" and the presentation of a written report (it is possible to submit the report in electronic form)

Theoretical preparation for exercises, i.e. basic knowledge in the field each exercise.. The ability to recognize and solve problems that arise during the exercise and the correct interpretation and understanding of the results obtained is assessed. The evaluation of the performance of tests, as well as the ability to cooperate in pairs (each pair of students performs a separate exercise) and individual work during the preparation and documentation of the conducted analysis (written report) are evaluated. The final mark of laboratory exercises is derived on the basis of partial assessments according to the following principles: 25% of the final grade is the average grade from six tests of theoretical knowledge (so-called "entries"); 50% of the final grade is a partial evaluation from the practical implementation of the experiment; 25% of the final grade is a partial assessment of the performance of the report containing the results, their analysis and interpretations, and final conclusions

### Method of verifying required learning outcomes

#### Required courses and introductory requirements

##### A. Formal requirements

Passed courses: General Microbiology, Organic Chemistry

Knowledge of the basics of Biophysics,

To take the final Biotechnology exam you must first pass the laboratory classes.

##### B. Prerequisites

Basis use of the biophysical equipment- UV-VIS spectrometer, chromatographs, pipets, etc. . Ability to handle laboratory equipment.

#### Aims of education

The aim of the course is to familiarize students with the practical processes of biotechnology and modern analytical techniques used in accredited laboratories and the pharmaceutical industry, petrochemical industry and production of cosmetics. At the course students are learn how to plan an experiment, the work is on the same instruments which are used in the industry. Particular emphasis is placed on issues related to the validation of methods and instruments, 17025 quality standard, ISO9001, GMP, GLP and teamwork.

#### Course contents

Laboratory exercises :

Ex.1 . Extraction of oil from oilseeds - obtaining oil from oilseeds by extraction , purification of the final product , determination of the process performance , quality control of the obtained oil;

Ex.2 . Purification of proteins - familiarization with the parameters of the protein purification chromatographic systems; effect of column type size on the resolution and efficiency of the process; protein concentration techniques, protein desalting

Ex. 3 Validation of instruments; IQ,PQ of UV/VIS spectrophotometer, automatic pipets qualification

Ex. 4 Validation of analytical methods in the pharmaceutical and cosmetic industries - familiarization with the basic parameters of validation methods, determination of the active substance in nonsteroidal anti-inflammatory drug using UV-VIS spectroscopy

Ex.5 . Biofuels – production and characterization of biofuels from vegetable oils ; determination of FAME amount in biofuels,

Ex.6 . Determination of protein concentration in food and feed

- Study the protein concentration of food and feed by Lowry method ; calibration curve

Ex.7 . Identification and determination of biologically active compounds, - extraction and analysis of biologically active compounds in high-anabolic nutrients using gas chromatography coupled with mass spectrometry

Topics of lectures :

Biomaterials in medicine

Bioreactors part . 1 and 2

Bioreactors - basic calculations

Processing products for agro-food industry

Biologically neutral and active surfaces and their application part 1 and 2

Mechanical Disruption Methods, homogenization

Genetically modified organisms (GMOs ) - selected modifications and law aspects

Types and distribution of biofuels - green energy sources

Biotechnological and Chemical methods in obtaining biofuels from natural sources part . 1 and 2

Instruments and methods qualification and validation

### Bibliography of literature

Literature required to pass the course

European Directorate for the Quality of Medicines & Healthcare, QUALITY MANAGEMENT (QM) GUIDELINES <http://www.edqm.eu>

European Pharmacopoeia, Absorption spectrophotometry, ultraviolet nad visible

S.L. Upstone, Ultraviolet/Visible Light Absorption Spectrophotometry in Clinical Chemistry in Encyclopedia of Analytical Chemistry R.A. Meyers (Ed.)

The International Conference on Harmonisation of Technical Requirements for Registration of Pharmaceuticals for Human Use (ICH)

<http://www.ich.org>

B Extracurricular readings

Current Protocols in Molecular Biology. Frederick M. Ausubel, Roger Brent, Robert E. Kingston, David D. Moore, J.G. Seidman, John A. Smith

Physical Biochemistry: Principles and Applications Author: David Sheehan

Principles of physical biochemistry / Kensal E. van Holde, W. Curtis Johnson, P. Shing

### The learning outcomes (for the field of study and specialization)

#### Knowledge

Has knowledge of basic research techniques and tools used in biotechnology.

Knows the modern methods of biotechnology; understands the basic techniques used in extraction, selection, synthesis, cultivation of microorganisms, tissues, cells on a semi-industrial scale. Applies basic principles of health and safety at work.

Understands the risks posed by work in the laboratory; identifies threats associated with conducting laboratory tests and risks when working with pathogenic organisms and GMOs

#### Skills

Has the competence to work in a team and individually. Has the basic skills necessary to work in the laboratory; can document the actions and results of experiments; in laboratory knows basic techniques and research tools necessary in biotechnology, with particular emphasis on the methods of extraction, modification, selection, purification of organic compounds, cultivation of microorganisms, tissues, cells; has the ability to use basic laboratory equipment.

#### Social competence

Has the competence to work in a team and individually, in particular the joint implementation of laboratory work and simple theoretical studies in the field of biotechnology and related fields and disciplines. Skills and competences in the field of practical laboratory work on basic biotechnological processes and analytical techniques. Ability to prepare reports on the carried out experiments

### Contact

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