UNIWERSYTET GDAŃSKI

| **Course title**<br>Biotechnologia/ Biotechnology | **ECTS code**<br>13.3.0414 |
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**Name of unit administrating study**
Faculty of Chemistry

**Studies**

| **Field of study** | **Type** | **Form** | |
|---|---|---|---|
| Chemistry | Bachelor | Full-time studies | |

**Teaching staff**
Dr hab. Bogdan Banecki, prof. nadzw., dr Wojciech Śledź

| **Forms of classes, the realization and number of hours** | **ECTS credits** 5 |
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| **A. Forms of classes, in accordance with the UG Rector's regulations**<br>lecture, laboratory classes | classes - 60 h<br>tutorial classes – 10 h<br>student's own work – 55 h |
| **B. The realization of activities**<br>in-class learning | Total: 125 h - 5 ECTS |
| **C. Number of hours**<br>60 h (30 h lecture, 30 h laboratory class) | |

**The academic cycle**
2021/22 summer semester

| **Type of course**<br>obligatory | **Language of instruction**<br>Polish |
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| **Teaching methods**<br><br>Practical exercises<br>Lectures with presentations | **Form and method of assessment and basic criteria for evaluation or examination requirements**<br><br>**A. Final evaluation, in accordance with the UG study regulations**<br>lecture – exam<br>laboratory classes – course completion (with a grade)<br><br>**B. Assessment methods**<br>Written exam with open questions, Oral exam (supplementary), Mid-term tests<br><br>D. **The basic criteria for evaluation** or exam requirements<br>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.<br>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)<br><br>Theoretical preparation for exercises, i.e. basic knowledge in the field each exercise..<br>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 |

**Required courses and introductory 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.

Basis use of the biophysical equiomen- 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 em-phasis 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 pro-cess; 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**

**A. 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 spectrphotometry, 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

**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