

Subject card

Subject name and code	Biotechnology, PG_00081885						
Field of study	Chemistry						
Date of commencement of studies	October 2026		Academic year of realisation of subject		2028/2029		
Education level	Bachelor's studies		Subject group		Obligatory subject group in the field of study Optional subject group 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	3		Language of instruction		Polish		
Semester of study	6		ECTS credits		2.0		
Learning profile	academic		Assessment form		credit		
Conducting unit	Faculty of Chemistry -> 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		5.0		15.0	50
Subject objectives	The objective of the course is to provide students with practical knowledge of biotechnological processes and modern analytical techniques used in accredited laboratories and the pharmaceutical, petrochemical, and cosmetic industries. The course will enable students to individually plan experiments, and interact with equipment and methods they will encounter in their future careers. Particular emphasis is placed on issues related to method validation techniques and measurement apparatus, quality standards 17025 and ISO9001, GLP, GMP and teamwork.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[CHEML3_W10] Enumerates and describes the basic aspects of the construction, operation and use of measuring apparatus and equipment used in experimental works in the field of chemistry and related sciences.	The student lists and describes the basic components of measurement apparatus used in biotechnology and related sciences. The student understands the operating principles of various types of measurement apparatus and experimental equipment. The student can identify applications of measurement apparatus in different fields of biotechnology.	[SW1] oral statement/ conversation/discussion
	[CHEML3_U03] Selects the appropriate equipment and laboratory apparatus for conducting uncomplicated chemical experiments.	The student is capable of assessing the suitability of various devices and apparatus in the context of specific analytical and research procedures.	[SU6] demonstration of practical skills
	[CHEML3_U02] Performs analyses using experimental methods and draws conclusions based on them.	Has 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	[SU6] demonstration of practical skills
	[CHEML3_K03] Establishes priorities in the right way for the implementation of tasks specified by herself/himself and/or by others.	The student can appropriately set priorities necessary to accomplish tasks defined by themselves or others.	[SK8] observation of student's independent or team work
	[CHEML3_U07] Prepares documented elaboration on a specific problem in the field of selected chemical and physical issues.	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.	[SU3] text preparation/written work
	[CHEML3_K05] Observes established procedures in laboratory work and is responsible for the safety of her/his and others' work.	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	[SK8] observation of student's independent or team work
	[CHEML3_W05] Has basic knowledge of the chemical specialisation studied.	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.	[SW4] test/exam - oral or written
	[CHEML3_K02] Works individually demonstrating initiative and independence of activity and cooperates in a team fulfilling various roles in it.	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.	[SK8] observation of student's independent or team work

Subject contents	Exercise 1: Extraction of Oil from Oilseed Plants - Obtaining oil from oilseed plant seeds through extraction; purification of the final product; determination of the yield of the applied process; quality control of the oil (including pH determination, acid number, and other parameters). Exercise 2: Purification of Protein Preparations - Introduction to the parameters of purifying preparations using a chromatographic system; the impact of column and bed parameters on the resolution and efficiency of the process; concentration techniques for preparations. Exercise 3: Validation of Apparatus and Measurement Equipment - Validation of a UV/VIS spectrophotometer, performance qualification (PQ), and installation qualification (IQ). Exercise 4: Validation of Analytical Methods in the Pharmaceutical and Cosmetic Industries - Introduction to the basic parameters of method validation for determining active substances using UV-VIS spectroscopy, exemplified by the determination of the active substance in Ketonal preparations. Exercise 5: Biofuels - Determination of parameters and production of biofuels; determination of FAME content in biofuels; production of biofuels from vegetable oil. Exercise 6: Determination of Protein Concentration in Food and Feed Products - Investigation of protein concentration in food and feed products using the Lowry method; preparation of protein solutions from the tested products and determination of protein concentration using a spectrophotometer.														
Prerequisites and co-requisites	Passed courses: General Microbiology, Organic Chemistry. Knowledge of the basics of Biophysics. Knowledge of the basic principles of biophysical apparatus, including UV-VIS spectrometry, gas chromatography, liquid chromatography, and mass spectrometry. Familiarity with fundamental processes in molecular biology, biotechnology, and microbiology. Proficiency in operating laboratory equipment.														
Assessment methods and criteria	<table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td>Practical performing of experiments</td><td>50.0%</td><td>50.0%</td></tr><tr><td>Reports</td><td>50.0%</td><td>25.0%</td></tr><tr><td>Average grade from six entry tests</td><td>50.0%</td><td>25.0%</td></tr></table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Practical performing of experiments	50.0%	50.0%	Reports	50.0%	25.0%	Average grade from six entry tests	50.0%	25.0%
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Recommended reading	Basic literature	1. W. Bednarski, A. Reps. "Biotechnologia żywności". 2. J. Bullock, B. Kristiansen. "Basic biotechnology". 3. Z. Libudzisz, K. Kowal. "Mikrobiologia techniczna". 4. P.P. Lewicki. "Inżynieria procesowa i aparaturowa przemysłu spożywczego". 5. J. Baldyga, M. Henczka, W. Podgórska. "Obliczenia w inżynierii bioreaktorów". 6. European Directorate for the Quality of Medicines & Healthcare, QUALITY MANAGEMENT (QM) GUIDELINES http://www.edqm.eu 7. European Pharmacopoeia, Absorption spectrophotometry, ultraviolet nad visible 8. S.L. Upstone, Ultraviolet/Visible Light Absorption Spectrophotometry in Clinical Chemistry in Encyclopedia of Analytical Chemistry R.A. Meyers (Ed.) 9. The International Conference on Harmonisation of Technical Requirements for Registration of Pharmaceuticals for Human Use (ICH) , http://www.ich.org/ 10. Protein purification handbook- wersje dostępne na stronach www producentów kolumn HPLC 11. Simultaneous HPLC determination of ketoprofen and its degradation products in the presence of preservatives in pharmaceuticals, Journal of Pharmaceutical and Biomedical Analysis 36 (2004) 625629 12. Biospektroskopia, praca zbiorowa pod red. Jacka Twardowskiego, Warszawa, PWN 13. Scripts for individual exercises provided by the instructors.
	Supplementary literature	1. K. Szewczyk "Technologia biochemiczna". 2. B. Tabiś, R. Grzywacz. "Procesy i reaktory biochemiczne". 3. P. Singleton. "Bakterie w biologii, biotechnologii i medycynie".
	eResources addresses	
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	

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