

KARTA PRZEDMIOTU**I. Dane podstawowe**

Nazwa przedmiotu	Techniki chromatograficzne
Nazwa przedmiotu w języku angielskim	Chromatographic techniques
Kierunek studiów	Biotechnologia
Poziom studiów (I, II, jednolite magisterskie)	I
Forma studiów (stacjonarne, niestacjonarne)	stacjonarne
Dyscyplina	Nauki biologiczne
Język wykładowy	Grupy w języku polskim – język polski Grupy w języku angielskim – język angielski

Koordinator przedmiotu/osoba odpowiedzialna	dr hab. Anna Szafranek-Nakoneczna
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Forma zajęć (<i>katalog zamknięty ze słownika</i>)	Liczba godzin	semestr	Punkty ECTS
wykład	-	-	3
konwersatorium	-	-	
ćwiczenia	30	II	
laboratorium	-	-	
warsztaty	-	-	
seminarium	-	-	
proseminarium	-	-	
lektorat	-	-	
praktyki	-	-	
zajęcia terenowe	-	-	
pracownia dyplomowa	-	-	
translatorium	-	-	
wizyta studyjna	-	-	

Wymagania wstępne	Basic knowledge of chemistry, physico-chemistry of biological systems, within the ranges accepted in the standards of education for these items. Ability for laboratory work according to health and safety procedures.
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II. Cele kształcenia dla przedmiotu

Acquiring the students with terminology used in chromatographic techniques.
Acquainted with the possibilities of using chromatographic techniques in a variety of analytical tests and in assessing the efficiency of biotechnological processes.
Acquisition by students of basic, practical skills of work with chromatography systems.

III. Efekty uczenia się dla przedmiotu wraz z odniesieniem do efektów kierunkowych

Symbol	Opis efektu przedmiotowego	Odniesienie do efektu kierunkowego
WIEDZA		
W_01	The student knows and describes the basic physical and chemical laws necessary to understand natural phenomena and biotechnological processes and used in chromatography.	K_W02
W_02	The student is able to compare the various chromatography techniques and indicate their use in the study of biotechnological processes.	K_W05
W_03	The student has knowledge of safety rules in the laboratory and work in a team.	K_W09
UMIEJĘTNOŚCI		
U_01	The student uses selected chromatographic techniques, can indicate their possibilities and limitations.	K_U01
U_02	The student is able to interpret the results obtained from the performed chromatographic measurements and make their critical analysis.	K_U02
U_03	The student designs, prepares and carries chromatographic analysis used to evaluate biotechnological processes.	K_U15
U_04	The student understands the need to continuously deepen and update their knowledge and skills in the field of chromatographic techniques, their use and modification. He/she shows openness to new solutions and opportunities offered by chromatography in biotechnology.	K_U17
KOMPETENCJE SPOŁECZNE		
K_01	Student demonstrates care for the workplace, entrusted equipment, willingness to work in a group with respect to the work of others and their own.	K_K04
K_02	The student behave in the laboratory in accordance with the principles of safety and hygiene of work. It has habits adequate to behave and work in laboratory.	K_K04

IV. Opis przedmiotu/ treści programowe

Introduction to classes, health and safety rules in force in the laboratory, the general requirements and conditions for completion of the exercise. A brief historical chromatography division of chromatographic methods, the basic concepts, terminology, definitions and construction of the chromatographic system, qualitative and quantitative analysis. applicability of chromatographic techniques in the study of the efficiency of biotechnological processes. Calibration methods and comparison of their accuracy. Optimization of the chromatographic separation, the basic analytical problems and the methods of dealing with them. Determination of the respiration activity of the microorganisms by gas chromatography. Theoretical basis of the GC-MS technique - application in biotechnology. Qualitative and quantitative analysis of amino acids obtained in microbiological production using the GC-MS technique. The use of liquid chromatography (HPLC) to determine the amount of caffeine in the beverages.

V. Metody realizacji i weryfikacji efektów uczenia się

Symbol efektu	Metody dydaktyczne (lista wyboru)	Metody weryfikacji (lista wyboru)	Sposoby dokumentacji (lista wyboru)
WIEDZA			
W_01	Laboratory analysis	Written test	Completed and evaluated test
W_02	Laboratory analysis	Written test	Completed and evaluated test
W_03	Laboratory analysis	Observation	Rating card
UMIEJĘTNOŚCI			
U_01	Laboratory classes	Observation / Report	Report printout / Report file
U_02	Practical classes	Report	Report printout / Report file
U_03	Laboratory classes	Observation / Report	Report printout / Report file
U_04	Practical classes	Report	Report printout / Report file
KOMPETENCJE SPOŁECZNE			
K_01	Laboratory classes	Observation	Rating card
K_02	Laboratory classes	Observation	Rating card

VI. Kryteria oceny, wagi...

Classes: Partial colloquia (3 per semester) - 90%, written reports on the exercises and timeliness of their submission - 10%

Mark	Evaluation criteria	
very good (5)	the student realizes the assumed learning outcomes at a very good level	the student demonstrates knowledge of the education content at the level of 91-100%
over good (4.5)	the student accomplishes the assumed learning outcomes an over good level	the student demonstrates knowledge of the education content at the level of 86-90 %
good (4)	the student accomplishes the assumed learning outcomes at a good level	the student demonstrates knowledge of the education content at the level of 71-85%
quite good (3.5)	the student accomplishes the assumed learning outcomes at a quite good level	the student demonstrates knowledge of the education content at the level of 66-70%
sufficient (3)	the student accomplishes the assumed learning outcomes at a sufficient level	the student demonstrates knowledge of the education content at the level of 51-65%
insufficient (2)	the student accomplishes	the student demonstrates knowledge of

	the assumed learning outcomes at an insufficient level	the education content below the level of 51%
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VII. Obciążenie pracą studenta

Forma aktywności studenta	Liczba godzin
Liczba godzin kontaktowych z nauczycielem	30
Liczba godzin indywidualnej pracy studenta	60

VIII. Literatura

Literatura podstawowa
Scot R.P.W., Principles and practice of chromatography, 2003 Poole C.F., Gas chromatography, Elsevier Inc., 2012 Braithwaite A., Smith F.J., Chromatographic methods, 5th edition, Kluwer Academic Publisher, 1999 Fanali S., Haddad P.L., Poole C.F., Schoenmakers P., Lloyd D., Liquid chromatography, Fundamentals and Instrumentation, Elsevier Inc., 2013
Literatura uzupełniająca
Dhanarasu S. (ed) Chromatography and its applications, InTech, 2012 Higson S., Analytical chemistry, Oxford University Press, 2001 Krull I.S.(eds), Analytical Chemistry. ISBN 978-953-51-0837-5, InTech, 2012 Dolan J. A Guide to HPLC and LC-MS Buffer Selection, ACE