KARTA PRZEDMIOTU

- **Dane podstawowe**

Nazwa przedmiotu	Metody analityczne w biotechnologii -kurs podstawowy
Nazwa przedmiotu w języku angielskim	Analytical methods in biotechnology – basic course
Kierunek studiów	Biotechnologia
Poziom studiów (I, II, jednolite magisterskie)	I
Forma studiów (stacjonarne, niestacjonarne)	stacjonarne
Dyscyplina	biologia
Język wykładowy	Grupy w języku polskim – język polski Grupy w języku angielskim – język angielski

Koordynator przedmiotu/osoba odpowiedzialna	dr Anna Szafranek-Nakonieczna

Forma zajęć*(katalog zamknięty ze słownika)*	Liczba godzin	semestr	Punkty ECTS
wykład	15	VI	5
konwersatorium	-	-	
ćwiczenia	30	VI	
laboratorium	-	-	
warsztaty	-	-	
seminarium	-	-	
proseminarium	-	-	
lektorat	-	-	
praktyki	-	-	
zajęcia terenowe	-	-	
pracownia dyplomowa	-	-	
translatorium	-	-	
wizyta studyjna	-	-	

Wymagania wstępne	The basic knowledge of general-, inorganic-, organic chemistry, and physics. Ability to work in laboratory according to OHS rules.

- **Cele kształcenia dla przedmiotu**

Acquaint of students with contemporary methods of instrumental analysis and their application in biotechnology.
Acquire the skills for analysis of selected physical and chemical phenomena which are used for characterisation of environmental samples and biotechnological processes.
Acquire by students the basic practical skills in using analytical techniques and instruments.

- **Efekty kształcenia dla przedmiotu wraz z odniesieniem do efektów kierunkowych**

Symbol	Opis efektu przedmiotowego	Odniesienie do efektu kierunkowego
WIEDZA		
W_01	Student possess basic knowledge essential for understanding and explaining fundamental physical and chemical phenomena used in analytical methods.	K_W03
W_02	Student possess knowledge in terms of analytical methods and their application in studying biotechnological processes and investigation solid, liquid and gas samples.	K_W03, K_W06
W_03	Student possess a basic knowledge in qualitative and quantitative methods used analytical techniques.	K_W03, K_W06
W_04	Student has a basic knowledge in terms of statistics and informatics allowing elaboration and interpretation obtained results.	K_W04
W_05	Student has a knowledge in terms of safety rules in analytical laboratory.	K_W09
UMIEJĘTNOŚCI		
U_01	Student does basic laboratory analysis using selected analytical methods for studying phenomena and determination the course of biotechnological processes.	K_U01
U_02	Student is able to indicate the proper technique for lab analyses, depending on sample character.	K_U05
U_03	Student is able to collect and protect properly environmental material for laboratory analyses.	K_U05
U_04	Student is able to estimate an analytical errors in respect to analytical techniques.	K_U10
U_05	Student is skilled in using scientific terminology and defines terms characterizing selected analytical methods.	K_U10
U_06	Based on conducted analyses student prepares report using scientific terms and concepts (also from statistics) and discusses obtained results.	K_U07, K_U10, K_U17
KOMPETENCJE SPOŁECZNE		
K_01	Student understands the need of continuous knowledge deepen, updating skills and the willingness to search for new research methods or the modification of already existing.	K_K01
K_02	Student shows the care for his/her workplace, entrusted equipment and the readiness to work in group.	K_K02
K_03	Student acquires habits necessary to work in research laboratory according to OHS rules.	K_K03

- **Opis przedmiotu/ treści programowe**

Lecture: Classic and instrumental methods. Type of errors and ways of their avoiding. Collecting and protection of research material. Basic concepts, laws, definitions and physicochemical phenomena of spectrophotometry UV/VIS, colorimetry, atomic absorption AAS, gas chromatography (GC), carbon analysis (TOC) in infrared and potentiometry (pH, Eh, EC, DO, ODR). Quantitative and qualitative analysis, ways of calibration of measuring systems. Statistical analysis of obtained data and their interpretation. Possibility of application of selected analytical methods in studying biotechnological processes.
Classes: Lab OHS and general requirements. Sample preparation for analyses. Measurement of selected physicochemical properties of liquid and solid samples using potentiometric methods (pH, Eh, EC, DO, ODR). Estimation of trace amounts of selected heavy metals in environmental samples using FAAS technique. Spectrophotometry UV/VIS in nitrogen measurements. Estimation of carbon content (organic, inorganic) in solid and liquid samples using TOC-VCSH analyser. Determination of respiration activity of soils and sediments by means of gas chromatography (GC) using internal standard method.

- **Metody realizacji weryfikacji efektów kształcenia**

Symbol efektu	Metody dydaktyczne *(lista wyboru)*	Metody weryfikacji *(lista wyboru)*	Sposoby dokumentacji *(lista wyboru)*
WIEDZA			
W_01	Conventional lecture	Exam	Evaluated written exam
W_02	Conventional lecture	Exam	Evaluated written exam
W_03	Conventional lecture Laboratory analysis	Exam Written test/test	Evaluated written exam Evaluated written test / Test
W_04	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	Practical classes	Report	Report printout / Report file
U_04	Practical classes	Observation / Report	Rating card / Report printout / Report file
U_05	Laboratory classes	Discussion / Report	Report printout / Report file
KOMPETENCJE SPOŁECZNE			
K_01	Laboratory classes	Observation	Rating card

- **Kryteria oceny, wagi…**

Lecture: Written exam - 90%, participation in lectures - 10%

Classes: Partial tests (3 per semester) - 90%, written reports on the classes 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 assumed learning outcomes at an insufficient level	the student demonstrates knowledge of the education content below the level of 51%

- **Obciążenie pracą studenta**

Forma aktywności studenta	Liczba godzin
Liczba godzin kontaktowych z nauczycielem	45
Liczba godzin indywidualnej pracy studenta	80

- **Literatura**

Grupy w języku polskim

Literatura podstawowa
Stępniewska Z., Charytoniuk P., Stefaniak E., Bennicelli R. P., Szmagara A., Bucior K., Kuczumow A., Mroczka R., Siurek J. 2001. Chemia analityczna w środowisku. EKO Kul, Lublin. Kocjan R., 2000. Chemia analityczna, Wydawnictwo Lekarskie PZWL, Warszawa.
Literatura uzupełniająca

Silverstein R. M., Webster F.X., Kiemle D.J., 2007. Spektroskopowe metody identyfikacji związków organicznych. PWN, Warszawa. Witkiewicz Z., Hetper J.2001. Chromatografia gazowa, Wydawnictwo Naukowo-Techniczne, Warszawa. Witkiewicz Z.: Podstawy chromatografii, 2005. Wydawnictwo Naukowo-Techniczne, Warszawa.

Grupy w języku angielskim

Literatura podstawowa
Harvey D., Analytical Chemistry 2.0, Electronic Versions, 2009 Higson S., Analytical chemistry, Oxford University Press, 2003. Stępniewski W., Stępniewska Z., Bennicelli R.P., Gliński J., Oxygenology in outline, Institute of Agrophysics PAS, Lublin, 2005.
Literatura uzupełniająca
Price N.C., Dwek R. A., Ratcliffe R. G., Wormald M. R., Principles and problems in physical chemistry for biochemists, Oxford University Press, 2001 Scragg A., Environmental biotechnology, Oxford University Press, 2005.