

**KARTA PRZEDMIOTU****I. Dane podstawowe**

Nazwa przedmiotu	Metody biotechnologiczne w farmacji
Nazwa przedmiotu w języku angielskim	Biotechnological methods in pharmacy
Kierunek studiów	Biotechnologia
Poziom studiów (I, II, jednolite magisterskie)	I
Forma studiów (stacjonarne, niestacjonarne)	stacjonarne
Dyscyplina	biologia
Język wykładowy	język angielski

Koordinator przedmiotu/osoba odpowiedzialna	Dr hab. inż. Andrea Baier
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Forma zajęć ( <i>katalog zamknięty ze słownika</i> )	Liczba godzin	semestr	Punkty ECTS
Wykład	30	III	6
ćwiczenia	30	III	

Wymagania wstępne	W1 – Knowledge in general microbiology, biochemistry and laboratory techniques W2 – Ability to perform basic laboratory work and work with microorganisms
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**II. Cele kształcenia dla przedmiotu**

C1 - To familiarize students with basic methods used in the pharmaceutical biotechnology C2 - To familiarize students with microbiological processes, eg. Biosynthesis and biotransformation, used in the production of biopharmaceutics C3 - To familiarize students with the process of production of antibiotics and their effects C4 – To familiarize students with law and ethical aspects using biotechnological methods in pharmacy
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**III. Efekty kształcenia dla przedmiotu wraz z odniesieniem do efektów kierunkowych**

Symbol	Opis efektu przedmiotowego	Odniesienie do efektu kierunkowego
<b>WIEDZA</b>		
W_01	The student is able to discuss the importance of macronutrients in human physiology. He explains the causes and ways to prevent deficiency of macro and micronutrients He knows the mechanisms of acquisition of antibiotic resistance by microorganisms	K_W01
W_02	The student explains the importance of microorganisms in the production of pharmaceutical preparations He knows how to use microbial strains in the production of antibiotics	K_W02

W_03	He describes and classifies antibiotics due to their structure, mechanism of action and biological activity	K_W03
W_04	The student describes the ways to get potential therapeutic substances produced by microorganisms	K_W06
W_05	The student understands the relation between biotechnological achievements and possibilities of their application in pharmaceutical industry	K_W08
W_06	He has knowledge of basic principles of health and safety	K_W09
<b>UMIĘTNOŚCI</b>		
U_01	The student applies basic techniques and research methods in the field of pharmaceutical biotechnology The student calculates the concentration of the substance and prepares buffers and media used for exercises	K_U01
U_02	He plans the process of biosorption of macronutrients by microorganisms He examines the tolerance of microorganisms to antibiotics. He determines the MIC of antibiotics for specific bacterial strains He performs horizontal gene transfer in bacteria. He interprets ways of acquiring resistance to antibiotics	K_U05
U_03	He prepares himself within the range of material necessary to perform experiments	K_U07
U_04	He takes part in discussions on topics related with the topic in classroom experiences and lectures	K_U08
U_05	He prepares an oral presentation on biotechnological techniques used in pharmacy	K_U09
<b>KOMPETENCJE SPOŁECZNE</b>		
K_01	Systematically deepens the knowledge and skills of biotechnological methods used in pharmacy	K_K01
K_02	He exhibits activity and independence in decision making and carrying out the tasks entrusted	K_K02
K_03	The student is able to work in a group, takes care of entrusted equipment, applies the safety rules	K_K03

#### IV. Opis przedmiotu/ treści programowe

**Wykład:** Basic issues are to obtain of potential therapeutic substances using microorganisms. Possibilities to obtain strains producing antibiotics. Basic elements of the biosynthesis of antibiotics and isolation. Methods for determining the sensitivity of microorganisms to antibiotics. Classification of antibiotics due to their structure, mechanism of action and biological activity. Methods used in the production of protein-mineral complexes, vitamins and other substances. Primary and secondary metabolites - biosynthesis. Production of drugs using methods from genetic engineering. Formulation of pharmaceutical products. Biotransformation. Production of vaccines and adjuvants. New directions of biotechnological methods in pharmacy: gene therapy, tissue engineering. Ethical aspects. Genetically modified organisms (GMO) in the production of pharmaceuticals.

**Ćwiczenie:** Basic issues are to obtain of potential therapeutic substances using microorganisms. Possibilities to obtain strains producing antibiotics. Basic elements of the biosynthesis of antibiotics and isolation. Methods for determining the sensitivity of microorganisms to antibiotics. Classification of antibiotics due to their structure, mechanism of action and biological activity.

Determination of the MIC of antibiotics to certain strains of microorganisms. Horizontal gene transfer. Methods for the acquisition of antibiotic resistance by microorganisms. Methods using yeast as a natural biosorbent of macronutrients. Yeast as a raw material for the production of protein-mineral preparations.

#### V. Metody realizacji i weryfikacji efektów kształcenia

Symbol efektu	Metody dydaktyczne (lista wyboru)	Metody weryfikacji (lista wyboru)	Sposoby dokumentacji (lista wyboru)
<b>WIEDZA</b>			
W_01	Conventional lecture laboratory analysis	Written test, report	Evaluated written test report printout
W_02			
W_03			
W_04			
W_05			
W_06			
<b>UMIEJĘTNOŚCI</b>			
U_01	Laboratory classes	Test, written test report	Evaluated written test report printout
U_02			
U_03			
U_04			
U_05			
<b>KOMPETENCJE SPOŁECZNE</b>			
K_01 K_02 K_03	Laboratory classes	Presentation observation	Protocol Observation report

#### VI. Kryteria oceny, wagi

lecture: written test

lab classes: 2 tests (80%), work during classes, reports (20%)

Mark	Evaluation criteria	
<b>Very good (5)</b>	the student realizes the assumed learning outcomes at a very good level	the student demonstrates knowledge of the education content at the level of 95-100%
<b>overgood (4.5)</b>	the student accomplishes the assumed learning outcomes an over good level	the student demonstrates knowledge of the education content at the level of 85-94 %
<b>Good (4)</b>	the student accomplishes the assumed learning outcomes at a good level	the student demonstrates knowledge of the education content at the level of 75-84%
<b>Quite good (3.5)</b>	the student accomplishes the assumed learning outcomes at a quite good level	the student demonstrates knowledge of the education content at the level of 65-74%

<b>sufficient (3)</b>	the student accomplishes the assumed learning outcomes at a sufficient level	the student demonstrates knowledge of the education content at the level of 51-64%
<b>insufficient (2)</b>	the student accomplishes the assumed learning outcomes at an insufficient level	the student demonstrates knowledge of the education content below the level of 51%

### VII. Obciążenie pracą studenta

Forma aktywności studenta	Liczba godzin
Liczba godzin kontaktowych z nauczycielem	60
Liczba godzin indywidualnej pracy studenta	90

### VIII. Literatura

Literatura podstawowa
N. Okafor: Modern Industrial Microbiology and Biotechnology, Science Publishers (2007) E.M.T. El-Mansi, C.F.A. Bryce, B. Dahhou, S. Sanchez, A.L. Demain, A.R. Allman: Fermentation Microbiology and Biotechnology, CRC Press (2012)