

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

Nazwa przedmiotu	Mikrobiologia przemysłowa
Nazwa przedmiotu w języku angielskim	Industrial microbiology
Kierunek studiów	Biotechnologia
Poziom studiów (I, II, jednolite magisterskie)	I
Forma studiów (stacjonarne, niestacjonarne)	stacjonarne
Dyscyplina	mikrobiologia
Język wykładowy	Grupy w języku polskim – język polski Grupy w języku angielskim – język angielski

Koordinator przedmiotu/osoba odpowiedzialna	Dr inż. Andrea Baier
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Forma zajęć ( <i>katalog zamknięty ze słownika</i> )	Liczba godzin	Semestr	Punkty ECTS
Wykład	30	V	6
konwersatorium			
ćwiczenia	45	V	
laboratorium			
warsztaty			
seminarium			
proseminarium			
lektorat			
praktyki			
zajęcia terenowe			
pracownia dyplomowa			
translatorium			
wizyta studyjna			

Wymagania wstępne	Knowledge in general microbiology, biochemistry with enzymology, genetic engineering, molecular biology
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**II. Cele kształcenia dla przedmiotu**

C1 - Introduction into microorganisms used in industry
C2 - Technical application of bacteria, yeast and fungi
C3 - Information about fermentation processes and fermented products
C4 - Information about biotechnological processes with application of microorganisms,
C5 - Introduction into methods used to increase the efficiency of biotechnological processes
C6 - Analysis of the efficiency of processes using microorganisms

### 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 students describes technologies used in industry using different catalysts (microorganisms, enzymes) as well as evaluates the dependence of efficiency of the obtained bioproduct from the used catalyst or the manner providing the process	K_W01
W_02	The student evaluates the type and characteristics of microorganisms useful for economy and identifies microbiological contaminations occurring in fermentation industry	K_W02
W_03	The student possesses knowledge concerning developments in industrial microbiology and its history, newest research and application of microorganisms in medicine, biotechnology, environmental protection and other fields in industry The student explains the mechanisms leading to the overproduction of economically important metabolites by microorganisms	K_W05
W_04	The student knows the of fundamental principles of H&S and displays psychophysical abilities in work environment	K_W09
<b>UMIEJĘTNOŚCI</b>		
U_01	The student applies microbiological techniques preparing inoculum for microbial cultures	K_U01
U_02	The student operates basic laboratory equipment	K_U03
U_03	The student chooses respective culture conditions and culture method as well as analyses the final product	K_U05
U_04	The student reports obtained experimental results, analyses and draws conclusions and interpretations	K_U07
<b>KOMPETENCJE SPOŁECZNE</b>		
K_01	The student is open-minded to modern research techniques	K_K01
K_02	The students is able to work in a team	K_K02
K_03	The student proceeds according to good practice regulations in the production of pharmaceutical substances and applies H&S procedures	K_K03

### IV. Opis przedmiotu/ treści programowe

**lecture:** Presentation of microorganisms with high importance in industry: bacteria belonging to different groups and eukaryotes (yeast and fungi). Isolation from natural environment and application by human, environmental influence on microorganisms and microorganisms on environment. Characterization of microorganisms and their metabolism, e.g. fermentation. Application of microorganisms in industry, e.g. in the production of alcohols, chemicals, food. Presentation of microorganisms able to provide different fermentation processes, like lactic acid fermentation, acetic acid fermentation, alcoholic fermentation. Application of yeast - *Saccharomyces cerevisiae* and production of fermented beverages. Application of fungi, citric acid fermentation.

Lab classes: Fungi *A.niger* – structure, characteristics, citric acid fermentation  
 Lactic acid bacteria – structure, characteristics, lactic acid fermentation  
 Yeast (Baker's, winery, distillery) - structure, characteristics, alcoholic fermentation  
 Production of vitamins by microorganisms, biosynthesis of glucose oxidase

#### 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 Discussion	Written test	Evaluated written test/test
W_02	Conventional lecture Discussion	Written test	Evaluated written test/test
W_03	Conventional lecture Discussion	Written test	Evaluated written test/test
W_04	Laboratory analysis	Observation	Observation report
<b>UMIEJĘTNOŚCI</b>			
U_01	Laboratory classes	Report	Report printout
U_02	Laboratory classes	Observation	Observation report
U_03	Practical classes	Test of practical skills	Rating card
U_04	Laboratory classes	report	Report printout
<b>KOMPETENCJE SPOŁECZNE</b>			
K_01 K_02 K_03	Laboratory classes	Observation	Observation report

#### VI. Kryteria oceny, wagi

Written test to pass the lecture: 100%

Lab classes:

80% grades from written tests

10% reports

10% practical skills

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 student demonstrates knowledge of the

	the assumed learning outcomes at a quite good level	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	75
Liczba godzin indywidualnej pracy studenta	75

### VIII. Literatura

Grupy w języku polskim

Literatura podstawowa
Libudzisz Z., Kowal K., Żakowska Z. Mikrobiologia techniczna. Tom I i II, PWN, 2007 i 2010
Bednarski W., Fiedurek J. Podstawy biotechnologii przemysłowej. PWN, Warszawa, 2017
Literatura uzupełniająca
Singelton P. Bakterie w biologii, biotechnologii i medycynie. PWN, 2000
Długoński J. Biotechnologia mikrobiologiczna. Wyd. Uniwersytetu Łódzkiego, Łódź, 1997

#### Grupy w języku angielskim

Literatura podstawowa
1) N. Okafor: Modern Industrial Microbiology and Biotechnology, Science Publishers (2007)
2) 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)
Literatura uzupełniająca
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