

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN  
of Environmental Sciences

## A list of syllabus subjects

**Field of study**

Environmental Engineering

**Speciality area**

**Level of study**

**Programm code**

4906-SMU-Biot\_KRK



06049-26-C

ECTS: 3

YEAR: 2018L

**BIOLOGICAL METHODS OF FOOD AND FEED PRESERVATION**  
**BIOLOGICAL METHODS OF FOOD AND FEED PRESERVATION****COURSE CONTENT**  
**CLASSES:**

Phenotypic identification and technological properties of microorganisms in fermented and biopreserved foods and feeds. Food fermentations employed to produce safe and shelf stable food products. Starter culture design. Protective cultures in food and feed and their impact in food safety. Antimicrobial activity of lactic acid bacteria and propionic acid bacteria.

**LECTURES:**

The fundamental aspects of the biologically viable methods for food and feed preservation. Principles of biopreservation. The beneficial fermentation processes used in order to reduce the rate of food/feed spoilage and to render the food/feed free from pathogenic microorganisms and metabolites. Bacteriocins and bacteriocin-producing bacteria: basic aspects and applications. Hurdle technology.

**EDUCATIONAL OBJECTIVE:**

The course aims at providing knowledge of the method used for food and feed preservation by using natural antimicrobials and microbiota thereby increasing the storage life of food and feed.

**DESCRIPTION OF LEARNING OUTCOMES FOR THE COURSE IN REALATION TO FIELD AND MAJOR LEARNING OUTCOMES**

Codes of learning outcomes in a major field of study:	T2A_K01+, T2A_K02+, T2A_K03+, T2A_K04+, T2A_K05+, T2A_K06+, T2A_K07+, T2A_U01++, T2A_U03+, T2A_U04+, T2A_U10++, T2A_W02+, T2A_W05+, T2A_W08++, T2A_W10+,
Codes of learning outcomes in a major area of study:	K2_K01+, K2_K02+, K2_K03+, K2_U01++, K2_U03+, K2_W05+, K2_W15+, K2_W16+, K2_W17+,

**LEARNING OUTCOMES:****Knowledge**

W1 - Defines and explains the terminology concerning microorganisms, the effect of antimicrobial agents on microorganisms; knows the selected types of fermentations used in food and feed production, products obtained by fermentation, their characteristics, application and properties. Has knowledge on the fermentation processes in terms of quality and microbiological safety, the role of lactic acid bacteria, protective cultures, hurdle technology.

**Skills**

U1 - Knows how to search and to summarise knowledge from available sources (handbooks, professional and scientific articles, the internet).  
U2 - Plans, conducts and analyses the results of simple laboratory experiments with the use of suitable methods and analytical procedures relevant in food microbiology.

**Social competence**

K1 - Evaluates the contribution of own work and other team members into the realization of various tasks.  
K2 - Works in a group and adopt different roles with the sense of responsibility and consequences for own and team performance.

**BASIC LITERATURE**

1) Edited by: Christophe Lacroix, Protective Cultures, Antimicrobial Metabolites and Bacteriophages for Food and Beverage Biopreservation, wyd. Woodhead Publishing Series in Food Science, Technology and Nutrition, 2011

**SUPPLEMENTARY LITERATURE**

1) Students choice, Based on own selection or supervisor advice, wyd. Elsevier, MDPI journals, 2008-2018

**Course / module**

Biological methods of food and feed preservation

**Fields of education:**

Obszar nauk technicznych

**Course status:** mandatory

**Course group:** C - przedmioty specjalnościowe

**ECTS code:** 06049-26-C

**Field of study:** Environmental Engineering

**Specialty area:**

**Educational profile:** General academic

**Form of study:** Stacjonarne

**Level of study:** Drugiego stopnia/ masters

**Year/Semester:** 1 / 1

**Type of course:**

Laboratory classes, Lecture

**Number of hours per semester/week:** Laboratory classes: 30, Lecture: 15

**Teaching forms and methods**

Laboratory classes(K1, K2, U1, U2, W1) :  
Laboratory classes – Individual work or work in a group, Lecture(W1) : Lectures – Multimedia presentations

**Form and terms of the verification results:**

LABORATORY CLASSES: Write-up - Report - results and conclusions from entrusted tasks(K1, U1) ;LABORATORY CLASSES: Evaluation of the work and cooperation in the group - Observation - engagement, creativity and fulfillment of entrusted tasks. Grading in a scale of 1 to 5. Practical skills and competences comprise 25% and 5%, respectively of the final grade(K2) ;LABORATORY CLASSES: Colloquium test - Colloquium test - Test with multiple-choice and openended questions which comprises 70% of the final grade. A grade of 60% is considered a "3" (the lowest passing grade). In case of failing the test, there is a possibility to re-take the test(U2, W1) ;LECTURE: Written exam - Exam - a written exam only with eventual oral clarification(W1)

**Number of ECTS points:** 3

**Language of instruction:** angielski

**Introductory courses:**

chemistry, biochemistry

**Preliminary requirements:**

Subject knowledge of organic chemistry, experimental biochemistry, biology of microorganisms

**Name of the organizational unit offering the course:**

Katedra Mikrobiologii Przemysłowej i Żywności,

**Person in charge of the course:**

dr Magdalena Olszewska,

**Course coordinators:**

dr Magdalena Olszewska,

**Notes:**

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## Detailed description of the awarded ECTS points - part B

**06049-26-C**  
**ECTS:3**  
**YEAR: 2018L**

### **BIOLOGICAL METHODS OF FOOD AND FEED PRESERVATION** **BIOLOGICAL METHODS OF FOOD AND FEED PRESERVATION**

The awarded number of ECTS points is composed of:

#### 1. Contact hours with the academic teacher:

- participation in: laboratory classes	30 h
- participation in: lecture	15 h
- consultation	4 h
	49 h

#### 2. Student's independent work:

- preparation of reports	11 h
- preparation to practical classes	10 h
- preparation to the exam and the colloquium test	20 h
	41 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 90 h : 30 h/ECTS = 3,00 ECTS  
average: **3 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher:	1,63 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work:	1,37 ECTS points,



ECTS: 1,5  
YEAR: 2018L

## BIOMARKERS OF ENVIRONMENTAL CONTAMINATION

### BIOMARKERS OF ENVIRONMENTAL CONTAMINATION

#### COURSE CONTENT CLASSES:

#### LECTURES:

#### EDUCATIONAL OBJECTIVE:

#### DESCRIPTION OF LEARNING OUTCOMES FOR THE COURSE IN REALATION TO FIELD AND MAJOR LEARNING OUTCOMES

Codes of learning outcomes in a major field of study:	T2A_K01+, T2A_K02+, T2A_K03+, T2A_K04+, T2A_K05+, T2A_K06+, T2A_K07+, T2A_U02+, T2A_U03+, T2A_U04+, T2A_U05+, T2A_U06++, T2A_U08+, T2A_U09+, T2A_W01++,
Codes of learning outcomes in a major area of study:	K2_K01+, K2_K02+, K2_K03+, K2_U02+, K2_U04+, K2_U06+, K2_U09+, K2_U16+, K2_W02++,

#### LEARNING OUTCOMES:

##### Knowledge

W1 - Student recognizes the threats to aquatic and terrestrial ecosystems, and can indicate the potential effects on the environment caused by pollution with different compounds of anthropogenic or natural origin

W2 - Student explains the mechanisms of interaction of the main groups of environmental pollutants at different levels of biological organization

##### Skills

U1 - Student uses molecular biology techniques to estimate negative effects of environmental pollutants on organism of fish. By combining the knowledge from the field of natural sciences and engineering, student interprets results obtained from the conducted experiments

##### Social competence

K1 - Student is aware of the methods to predict the risk and potential consequences associated with pollution of the environment

K2 - Student updates his knowledge from the field of ecotoxicology and molecular toxicology and knows its practical meaning in the terms of environmental biomonitoring

#### BASIC LITERATURE

1) Huggett R.J., , Biomarkers: biochemical, physiological, and histological markers of anthropogenic stress, wyd. Lewis Publishing, 1992 ; 2) McCarthy J.F., Shugart L.R., Biomarkers of environmental contamination. , wyd. Lewis Publishers, 1990 ; 3) Penningroth, S., , Essentials of Toxic Chemical Risk Science and Society, wyd. CRC Press, London, 2010 ; 4) Walker C. H., Hopkin S. P., Sibly R. M., Peakall B., Principles of Ecotoxicology, , wyd. Third Edition. CRC Press, 2005

#### SUPPLEMENTARY LITERATURE

1) Logan, J., Edwards, K., Saunders, N., Real Time PCR: Current technology and applications, wyd. Caister Academic Press., 2009 ; 2) Brown T.A., , Genomes 3, wyd. . Garland Science Publishing, 2007 ; 3) Fisher J., Arnold, J.R.P., Chemistry for Biologists. Instant Notes Series., wyd. Bios Scientific Publishers, Oxford, 2000

#### Course / module

Biomarkers of environmental contamination

#### Fields of education:

Obszar nauk technicznych

**Course status:** facultative

**Course group:** C - przedmioty specjalnościowe

**ECTS code:**

**Field of study:** Environmental Engineering

**Specialty area:**

**Educational profile:** General academic

**Form of study:** Stacjonarne

**Level of study:** Drugiego stopnia/ masters

**Year/Semester:** 1 / 1

#### Type of course:

Lecture, Project classes

**Number of hours per semester/week:** Lecture: 5, Project classes: 15

#### Teaching forms and methods

Lecture(K1, K2, U1, W1, W2) : , Project classes(K1, K2, U1, W1, W2) :

#### Form and terms of the verification results:

LECTURE: Colloquium test - null(K1, K2, U1, W1, W2) ;PROJECT CLASSES: Report - null(K1, K2, U1, W1, W2)

**Number of ECTS points:** 1,5

**Language of instruction** angielski

#### Introductory courses:

#### Preliminary requirements:

#### Name of the organizational unit offering the course:

Katedra Biotechnologii w Ochronie Środowiska,

#### Person in charge of the course:

prof. dr hab. Paweł Brzuzan,

#### Course coordinators:

dr inż. Maciej Woźny, , Mohammed Alhamarna,

#### Notes:

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## Detailed description of the awarded ECTS points - part B

**ECTS:1,5**  
**YEAR: 2018L**

### **BIOMARKERS OF ENVIRONMENTAL CONTAMINATION** **BIOMARKERS OF ENVIRONMENTAL CONTAMINATION**

The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

- participation in: project classes	15 h
- participation in: lecture	5 h
- consultation	1 h
	21 h

2. Student's independent work:

0 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 21 h : 30 h/ECTS = 0,70 ECTS  
average: **1,5 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 0,70 ECTS points,  
- including the number of ECTS points for hours completed in the form of the student's independent work: 0,80 ECTS points,



**BIOPRODUCTS FROM WASTE MATERIALS**  
**BIOPRODUCTS FROM WASTE MATERIALS**

**ECTS: 3**  
**YEAR: 2018L**

**COURSE CONTENT**  
**CLASSES:**

**LECTURES:**

**EDUCATIONAL OBJECTIVE:**

**DESCRIPTION OF LEARNING OUTCOMES FOR THE COURSE IN REALATION TO FIELD AND MAJOR LEARNING OUTCOMES**

Codes of learning outcomes in a major field of study: T2A\_K01+, T2A\_K05+, T2A\_K07+, T2A\_U02+, T2A\_U03+, T2A\_U04+++, T2A\_U05+, T2A\_U06++, T2A\_W02+, T2A\_W05+, T2A\_W08++,

Codes of learning outcomes in a major area of study: K2\_K02+, K2\_K03+, K2\_U02+, K2\_U04+, K2\_U13++, K2\_U16+, K2\_W05+, K2\_W07+,

**LEARNING OUTCOMES:**

**Knowledge**

W1 - Knowledge of the rules of the sustainable use of the environment, therein use of waste as a resources

**Skills**

U1 - Ability to present the results of the performed experiments and to work in a team

U2 - ability to calculate parameters for biotechnological processes, e.g. composting, anaerobic digestion, ability to classify biochars

**Social competence**

K1 - Willingness to cooperate in a team and orientation for their own intellectual development

K2 - Understands the need to use principles of sustainable development in environmental engineering, therein use of waste as source of bioproducts

**BASIC LITERATURE**

1) Kuhad, R. C., & Ward, O. P. , Advances in applied bioremediation, wyd. Springer, 2009 ; 2) ed. A.M. Martin , Bioconversion of waste materials to industrial products, wyd. Blackie Academic & Professional, 1998 ; 3) different authors, Publications about composting and compost available on Elsevier service, wyd. Elsevier service, 2017-2018

**SUPPLEMENTARY LITERATURE**

**Course / module**

Bioproducts from waste materials

**Fields of education:**

Obszar nauk technicznych

**Course status:** mandatory

**Course group:** C - przedmioty specjalnościowe

**ECTS code:**

**Field of study:** Environmental Engineering

**Specialty area:**

**Educational profile:** General academic

**Form of study:** Stacjonarne

**Level of study:** Drugiego stopnia/ masters

**Year/Semester:** 1 / 1

**Type of course:**

Laboratory classes, Lecture, Project classes

**Number of hours per semester/week:** Laboratory classes: 20, Lecture: 15, Project classes: 10

**Teaching forms and methods**

Laboratory classes(K1, K2, U1, U2, W1) ; , Lecture(K1, K2, W1) ; , Project classes(K1, K2, U1, U2, W1) ;

**Form and terms of the verification results:**

LABORATORY CLASSES: Report - null(K1, K2, U1, U2, W1) ;LECTURE: Colloquium test - null(K1, K2, U1, U2, W1) ;PROJECT CLASSES: Project - null(K1, K2, U1, U2, W1)

**Number of ECTS points:** 3

**Language of instruction** angielski

**Introductory courses:**

**Preliminary requirements:**

**Name of the organizational unit offering the course:**

Katedra Biotechnologii w Ochronie Środowiska,

**Person in charge of the course:**

dr hab. inż. Dorota Kulikowska, prof. UWM

**Course coordinators:**

dr hab. inż. Dorota Kulikowska, prof. UWM, dr inż. Katarzyna Bułkowska, , dr hab. inż. Zygmunt Gusiatin, , dr hab. inż. Tomasz Pokój,

**Notes:**

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## Detailed description of the awarded ECTS points - part B

**ECTS:3**  
**YEAR: 2018L**

### **BIOPRODUCTS FROM WASTE MATERIALS** **BIOPRODUCTS FROM WASTE MATERIALS**

The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

- participation in: project classes	10 h
- participation in: laboratory classes	20 h
- participation in: lecture	15 h
- consultation	4 h
	49 h

2. Student's independent work:

0 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 49 h : 30 h/ECTS = 1,63 ECTS  
average: **3 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher:	1,63 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work:	1,37 ECTS points,



ECTS: 1  
YEAR: 2018L

## BIOREFINERIES BIOREFINERIES

COURSE CONTENT  
CLASSES:

LECTURES:

EDUCATIONAL OBJECTIVE:

### DESCRIPTION OF LEARNING OUTCOMES FOR THE COURSE IN REALATION TO FIELD AND MAJOR LEARNING OUTCOMES

Codes of learning outcomes in a major field of study:

T2A\_K01+, T2A\_K02+, T2A\_K03+, T2A\_K04+, T2A\_K05+, T2A\_K06+, T2A\_K07+, T2A\_U02+, T2A\_U03+, T2A\_U04++, T2A\_U05+, T2A\_U06++, T2A\_U09+, T2A\_U10+++, T2A\_U14+, T2A\_U17+, T2A\_U19+, T2A\_W02+, T2A\_W07+, T2A\_W08+,

Codes of learning outcomes in a major area of study:

K2\_K01+, K2\_K02+, K2\_K03+, K2\_U02+, K2\_U04+, K2\_U07+, K2\_U10+, K2\_U13+, K2\_U14+, K2\_U16+, K2\_W04+, K2\_W12+, K2\_W16+,

### LEARNING OUTCOMES:

#### Knowledge

W1 - Knowledge of the principles of designing and operation of biorefineries

W2 - Knowledge of solutions used for conversion waste biomass into value added products

#### Skills

U1 - Ability to present and discuss the proposed unit operations and processes of biorefinery concept designed and to work in a team

U2 - Ability to choose, design and assess the proper unit operations and processes of biorefineries technologies

#### Social competence

K1 - Willingness to cooperate in a team and orientation for their own intellectual development

K2 - Understands the need to use principles of sustainable development in environmental biotechnology

### BASIC LITERATURE

1) Ashok Pandey A., Rainer Höfer R., Taherzadeh M., Nampoothiri M., Larroche C. (Eds.), Industrial Biorefineries and White Biotechnology, wyd. 1st Edition. Elsevier, 2015 ; 2) Bhaskar T., Pandey A., Mohan S.V., Lee D.-J., Khanal S.K. (Eds.), Waste Biorefinery: Potential and Perspectives, wyd. 1st Edition. Elsevier, 2018 ; 3) Aresta M., Dibenedetto A., Dumeignil F. (Eds.), Biorefinery: From Biomass to Chemicals and Fuels, wyd. De Gruyter, 2012 ; 4) Aresta M., Dibenedetto A., Dumeignil F. (Eds.), Biorefineries: An Introduction, wyd. 1st Edition. De Gruyter, 2012 ; 5) Mussatto S.I. (Ed.), Biomass Fractionation Technologies for a Lignocellulosic Feedstock Based Biorefinery, wyd. 1st Edition. Elsevier, 2016 ; 6) Sadhukhan J., Ng K.S., Hernandez E.M., Biorefineries and Chemical Processes: Design, Integration and Sustainability Analysis, wyd. 1st Edition. Wiley, 2014 ; 7) Qureshi N., Hodge D., Vertes A. (Eds.), Biorefineries: Integrated Biochemical Processes for Liquid Biofuels, wyd. 1st Edition. Elsevier, 2014 ; 8) Alzate C.A.C., Botero J.M., Marulanda V.A., Biorefineries: Design and Analysis, wyd. 1st Edition. CRC Press, 2018 ; 9) Yang S.-T., El-Ensashy H., Thongchul N. (Eds.), Bioprocessing Technologies in Biorefinery for Sustainable Production of Fuels, Chemicals, and Polymers, wyd. 1st Edition. Wiley-AIChE., 2013 ; 10) Stuart P.R., El-Halwagi M.M. (Eds.), Integrated Biorefineries: Design, Analysis, and Optimization (Green Chemistry and Chemical Engineering), wyd. 1st Edition. CRC Press, 2012

### SUPPLEMENTARY LITERATURE

#### Course / module

Biorefineries

#### Fields of education:

Obszar nauk technicznych

Course status: mandatory

Course group: B - przedmioty kierunkowe

ECTS code:

Field of study: Environmental Engineering

Specialty area:

Educational profile: General academic

Form of study: Stacjonarne

Level of study: Drugiego stopnia/ masters

Year/Semester: 1 / 1

#### Type of course:

Lecture, Project classes

Number of hours per semester/week: Lecture: 5, Project classes: 15

#### Teaching forms and methods

Lecture(K1, K2, U1, U2, W1, W2) ; Project classes(K1, K2, W1, W2) :

#### Form and terms of the verification results:

LECTURE: Colloquium test - null(K1, K2, U1, U2, W1, W2) ;PROJECT CLASSES: Colloquium test - null(K1, K2, U1, U2, W1, W2)

Number of ECTS points: 1

Language of instruction: angielski

#### Introductory courses:

#### Preliminary requirements:

#### Name of the organizational unit offering the course:

Katedra Biotechnologii w Ochronie Środowiska,

#### Person in charge of the course:

prof. dr hab. inż. Irena Wojnowska-Baryła,

#### Course coordinators:

dr hab. inż. Zygmunt Gusiatiń, dr hab. inż. Tomasz Pokój,

#### Notes:

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## Detailed description of the awarded ECTS points - part B

**ECTS:1**  
**YEAR: 2018L**

### **BIOREFINERIES** **BIOREFINERIES**

The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

- participation in: project classes	15 h
- participation in: lecture	5 h
- consultation	4 h
	24 h

2. Student's independent work:

0 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 24 h : 30 h/ECTS = 0,80 ECTS  
average: **1 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher:	0,80 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work:	0,20 ECTS points,



**BIOTECHNOLOGY OF SOLID WASTE  
BIOTECHNOLOGY OF SOLID WASTE**

**ECTS: 1,5  
YEAR: 2018L**

**COURSE CONTENT  
CLASSES:**

**LECTURES:**

**EDUCATIONAL OBJECTIVE:**

**DESCRIPTION OF LEARNING OUTCOMES FOR THE COURSE IN REALATION TO FIELD AND MAJOR  
LEARNING OUTCOMES**

Codes of learning outcomes in a major field of study: T2A\_K01+, T2A\_K02+, T2A\_K03+, T2A\_K04+, T2A\_K06+, T2A\_U02+, T2A\_U05+, T2A\_U08+, T2A\_U09+, T2A\_U10+, T2A\_W01+, T2A\_W02+, T2A\_W08+,

Codes of learning outcomes in a major area of study: K2\_K01+, K2\_K03+, K2\_U02+, K2\_U06+, K2\_U07+, K2\_W02+, K2\_W05+,

**LEARNING OUTCOMES:**

**Knowledge**

W1 - Characteristics and scope of the problems associated with the disposal of solid waste. Defining and recognizing the desirability of the use of biotechnological methods, depending on the quantity and quality of solid waste

W2 - The integration of knowledge in the field of waste disposal. Knowledge of the expectations and consequences in relation to the implemented solutions to solid waste disposal

**Skills**

U1 - Analyses of the properties of solid waste. Knows the biotechnological solutions depending on the quantity and quality of waste and strategies

U2 - Prepares the concept of using biological processes of disposal of solid waste. Posses the knowledge of low regulations concerning the treatment and disposal of solid waste

U3 - Can be able to evaluate biotechnological solutions and priorities in dealing with solid waste

**Social competence**

K1 - The student is aware of the importance of technologies to prevent environmental degradation

K2 - Is able to work in the team. Is aware of the need for life-long learning and self-education

**BASIC LITERATURE**

1) H-J. Jordening, J. Winter, , Environmental biotechnology, wyd. Wiley-Vch, 2002 ; 2) Lens P. Hamelers B., Hoitink H, Bidlingmaier W., Resource, recovery and reuse in organic solid waste management, wyd. IWA Publishing, 2004 ; 3) different autos, , Materials and laboratory protocols given by a teacher., wyd. author's script, 2018

**SUPPLEMENTARY LITERATURE**

1) different autos, Scientific publications in the field, wyd. various publications, 2018

**Course / module**

Biotechnology of solid waste

**Fields of education:**

Obszar nauk technicznych

**Course status:** facultative

**Course group:** C - przedmioty specjalnościowe

**ECTS code:**

**Field of study:** Environmental Engineering

**Specialty area:**

**Educational profile:** General academic

**Form of study:** Stacjonarne

**Level of study:** Drugiego stopnia/ masters

**Year/Semester:** 1 / 1

**Type of course:**

Lecture, Project classes

**Number of hours per semester/week:** Lecture: 5, Project classes: 15

**Teaching forms and methods**

Lecture(K1, K2, W1, W2) : , Project classes(K1, K2, U1, U2, U3) :

**Form and terms of the verification results:**

LECTURE: Colloquium test - null(K1, K2, U1, U2, U3, W1, W2) ;PROJECT CLASSES: Colloquium test - null(K1, K2, U1, U2, U3, W1, W2)

**Number of ECTS points:** 1,5

**Language of instruction** angielski

**Introductory courses:**

**Preliminary requirements:**

**Name of the organizational unit offering the course:**

Katedra Biotechnologii w Ochronie Środowiska,

**Person in charge of the course:**

dr hab. inż. Katarzyna Bernat,

**Course coordinators:**

**Notes:**

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## Detailed description of the awarded ECTS points - part B

**ECTS:1,5**  
**YEAR: 2018L**

### **BIOTECHNOLOGY OF SOLID WASTE** **BIOTECHNOLOGY OF SOLID WASTE**

The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

- participation in: project classes	15 h
- participation in: lecture	5 h
- consultation	1 h
	21 h

2. Student's independent work:

0 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 21 h : 30 h/ECTS = 0,70 ECTS  
average: **1,5 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 0,70 ECTS points,  
- including the number of ECTS points for hours completed in the form of the student's independent work: 0,80 ECTS points,



**06949-26-O**  
**ECTS: 2**  
**YEAR: 2018L**

**DESIGN THINKING**  
**DESIGN THINKING**

**COURSE CONTENT**  
**CLASSES:**

**LECTURES:**

**EDUCATIONAL OBJECTIVE:**

**DESCRIPTION OF LEARNING OUTCOMES FOR THE COURSE IN REALATION TO FIELD AND MAJOR LEARNING OUTCOMES**

Codes of learning outcomes in a major field of study: T2A\_K01+, T2A\_K03+, T2A\_K04+, T2A\_K06+, T2A\_U01+, T2A\_U04+, T2A\_U05+, T2A\_W05+,  
Codes of learning outcomes in a major area of study: K2\_K01+, K2\_K03+, K2\_U01+, K2\_U02+, K2\_U03+, K2\_W17+,

**LEARNING OUTCOMES:**

**Knowledge**

W1 - Posiada wiedzę na temat aktualnych trendów w danej dziedzinie.

**Skills**

U1 - Potrafi pozyskiwać informacje z dostępnych baz danych i krytycznie je analizuje

**Social competence**

K1 - Potrafi myśleć i działać w sposób kreatywny i przedsiębiorczy

**BASIC LITERATURE**

1) Dowlolny, Artykuły z zakresu realizowanego projektu, wyd. dowolne, max 5 lat

**SUPPLEMENTARY LITERATURE**

**Course / module**

Design thinking

**Fields of education:**

Obszar nauk technicznych

**Course status:** mandatory

**Course group:** O - przedmioty kształcenia ogólnego

**ECTS code:** 06949-26-O

**Field of study:** Environmental Engineering

**Specialty area:**

**Educational profile:** General academic

**Form of study:** Stacjonarne

**Level of study:** Drugiego stopnia/ masters

**Year/Semester:** 1 / 1

**Type of course:**

Auditorium classes

**Number of hours per semester/week:** Auditorium classes: 30

**Teaching forms and methods**

Auditorium classes(K1, U1, W1) :

**Form and terms of the verification results:**

AUDITORIUM CLASSES: Presentation - null(K1, U1, W1)

**Number of ECTS points:** 2

**Language of instruction** polski

**Introductory courses:**

**Preliminary requirements:**

**Name of the organizational unit offering the course:**

Katedra Mleczarstwa i Zarządzania Jakością,

**Person in charge of the course:**

dr hab. inż. Anna Tarczyńska,

**Course coordinators:**

dr inż. Adriana Łobacz,

**Notes:**

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## Detailed description of the awarded ECTS points - part B

**06949-26-O**  
**ECTS:2**  
**YEAR: 2018L**

### **DESIGN THINKING** **DESIGN THINKING**

The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

- participation in: auditorium classes	30 h
- consultation	2 h
	32 h

2. Student's independent work:

-	5 h
-	15 h
-	8 h
	28 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 60 h : 30 h/ECTS = 2,00 ECTS  
average: **2 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher:	1,07 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work:	0,93 ECTS points,



## ENVIRONMENTAL BIOTECHNOLOGY

ECTS: 4

YEAR: 2018L

COURSE CONTENT  
CLASSES:

## LECTURES:

## EDUCATIONAL OBJECTIVE:

DESCRIPTION OF LEARNING OUTCOMES FOR THE COURSE IN REALATION TO FIELD AND MAJOR  
LEARNING OUTCOMESCodes of learning outcomes in a major field  
of study:T2A\_K01+, T2A\_K05+, T2A\_K07+, T2A\_U02+, T2A\_U03++,  
T2A\_U04+++ , T2A\_U05+, T2A\_U06++, T2A\_U09+, T2A\_U10++  
+, T2A\_U11+, T2A\_U14+, T2A\_U16+, T2A\_U17+, T2A\_U18+,  
T2A\_U19++, T2A\_W02+, T2A\_W03+, T2A\_W07+, T2A\_W08++,Codes of learning outcomes in a major area  
of study:K2\_K02+, K2\_K03+, K2\_U02+, K2\_U03+, K2\_U04+, K2\_U07+,  
K2\_U10+, K2\_U13+, K2\_U14+, K2\_U15+, K2\_U16+, K2\_W04+,  
K2\_W09+, K2\_W12+, K2\_W16++,

## LEARNING OUTCOMES:

## Knowledge

W1 - Knowledge of the principles of designing and operation of biotechnological systems

W2 - Knowledge of solutions used for effective protection of the environment concerning wastewater treatment, sludge management and soil bioremediation

## Skills

U1 - Ability to present and discuss the results of the performed experiments and to work in a team

U2 - Ability to choose, design and assess the efficiency of proecological technologies

## Social competence

K1 - Willingness to cooperate in a team and orientation for their own intellectual development

K2 - Understands the need to use principles of sustainable development in environmental engineering

## BASIC LITERATURE

1) Kuhad, R. C., & Ward, O. P. , Advances in applied bioremediation, wyd. A. Singh (Ed.). Berlin: Springer-Verlag, 2009 ; 2) Sáenz-Marta, C. I., de Lourdes Ballinas-Casarrubias, M., Rivera-Chavira, B. E., & Nevárez-Moorillón,, Biosurfactants as useful tools in bioremediation. In Advances in Bioremediation of Wastewater and Polluted Soil., wyd. InTech. , 2015 ; 3) Jördening H. J., Winter J. (Eds.) , Environmental Biotechnology: Concepts and Applications., wyd. Wiley-Blackwell, 2005 ; 4) Evans G. G., Furlong J. , . Environmental Biotechnology: Theory and Application., wyd. Wiley-Blackwell., 2010 ; 5) Rittmann B. E., McCarty P. L. , Environmental Biotechnology: Principles and Applications. , wyd. McGraw-Hill, 2001 ; 6) different authors, Wastewater Engineering (Treatment, Disposal, Reuse) , wyd. McGraw-Hill International Editions , 1991 ; 7) different authors, Wastewater treatment plant design, Ed. P.A. Vesilind, wyd. IWA Publishing, , 2003 ; 8) different authors, Publications on sewage sludge disposal available on the Elsevier service, wyd. Elsevier service, 2017-2018 ; 9) different authors, Sewage Sludge Assessment, Treatment & Environmental Impact., wyd. Nova Science Publishers Inc, 2017

## SUPPLEMENTARY LITERATURE

## Course / module

Environmental biotechnology

## Fields of education:

Obszar nauk technicznych

Course status: mandatory

Course group: A - przedmioty podstawowe

ECTS code:

Field of study: Environmental Engineering

Specialty area:

Educational profile: General academic

Form of study: Stacjonarne

Level of study: Drugiego stopnia/ masters

Year/Semester: 1 / 1

## Type of course:

Laboratory classes, Lecture, Field classes

Number of hours per semester/week: Laboratory classes: 30, Lecture: 15, Field classes: 15

## Teaching forms and methods

Laboratory classes(K1, K2, U1, U2, W1, W2) : , Lecture(K1, K2, W1, W2) : , Field classes(K1, K2, U1, U2, W1, W2) :

## Form and terms of the verification results:

LABORATORY CLASSES: Report - null(K1, K2, U1, U2, W1, W2); LECTURE: Colloquium test - null(K1, K2, U1, U2, W1, W2); FIELD CLASSES: Write-up - null(K1, K2, U1, U2, W1, W2)

Number of ECTS points: 4

Language of instruction: polski

## Introductory courses:

## Preliminary requirements:

## Name of the organizational unit offering the course:

Katedra Biotechnologii w Ochronie Środowiska,

## Person in charge of the course:

dr hab. inż. Agnieszka Cydzik-Kwiatkowska,

## Course coordinators:

dr hab. inż. Agnieszka Cydzik-Kwiatkowska, , dr hab. Magdalena Zielińska, , dr hab. inż. Zygmunt Gusiatiń, , dr inż. Sławomir Kasiński,

## Notes:

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## Detailed description of the awarded ECTS points - part B

**ECTS:4**  
**YEAR: 2018L**

### ENVIRONMENTAL BIOTECHNOLOGY

The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

- participation in: field classes	15 h
- participation in: laboratory classes	30 h
- participation in: lecture	15 h
- consultation	2 h
	62 h

2. Student's independent work:

0 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 62 h : 30 h/ECTS = 2,07 ECTS  
average: **4 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher:	2,07 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work:	1,93 ECTS points,



ECTS: 1,5  
YEAR: 2018L

## FERMENTED PRODUCTS IN FOOD AND FEED CHAIN FERMENTED PRODUCTS IN FOOD AND FEED CHAIN

### COURSE CONTENT CLASSES:

Evaluating the quality of different types of fermented meat products; the laboratory baking trials and quality evaluation of obtained wheat and rye bread; Yoghurt and cheese making practical sessions. Evaluation of technological parameters necessary for obtaining key product characteristics.

### LECTURES:

The fundamental basis of the production process of fermented meat products, including sausages and dry-fermented hams. The fundamental basis of the breadmaking process. The role of dough fermentation process in wheat and rye bread production and its final quality. The use of microbial cultures for preparing dough during breadmaking process. The role of microorganisms in production and safety of dairy products. Basic biochemistry on selected microorganism metabolism/fermentation to control processing conditions for the desired finished product quality.

### EDUCATIONAL OBJECTIVE:

This course is intended to familiarize students with the role of microbials in chosen food products of animal (milk, meat) and plant origin. The issues related to the production and evaluation of fermented products, sausages and hams, will be raised. The role of yeast and sourdough microbials in the production of wheat and rye bread will be presented. The influence of dough proofing, the role of different stages of bulk fermentation on the final quality of obtained bread will be underlined. The technological role of different microorganisms, especially lactic acid bacteria (LAB) will be discussed in products like yoghurt and cheese. The focus will be also on the application of beneficial bacteria on physicochemical, rheological and sensory properties of dairy products.

### DESCRIPTION OF LEARNING OUTCOMES FOR THE COURSE IN REALATION TO FIELD AND MAJOR LEARNING OUTCOMES

Codes of learning outcomes in a major field of study: T2A\_K01++, T2A\_U02++, T2A\_U05++, T2A\_U07++, T2A\_W02+, T2A\_W06++, T2A\_W08++

Codes of learning outcomes in a major area of study: K2\_K03+, K2\_U02+, K2\_U05+, K2\_W06+, K2\_W10+, K2\_W16+

### LEARNING OUTCOMES:

#### Knowledge

W1 - The student explains the course of the fermentation process in the production of fermented cured meats, bread, cheese and yogurt and its impact on the quality and safety of products.

W2 - The student knows the principles of safety and hygiene at work

#### Skills

U1 - The student prepares a report with the results of the trials

U2 - The student has the ability to work in a team when performing analytical tasks and preparing reports

#### Social competence

K1 - The student understands the need for continuous learning and competences development

### BASIC LITERATURE

1) różni autorzy, Meat Science (journal), wyd. Elsevier, 2000-2018 ; 2) różni autorzy, Food Microbiology (journal), wyd. Elsevier, 2000-2018 ; 3) różni autorzy, Journal of Cereal Science (journal), wyd. Elsevier, 2000-2018 ; 4) Fox P.F., P.L.H. McSweeney, T.M. Cogan, and T.P. Guinee, Cheese. Chemistry, Physics, and Microbiology, wyd. Elsevier Academic Press. London. UK, 2004 ; 5) Tamime A.Y., and R.K. Robinson, Yoghurt. Science and technology., wyd. Woodhead Publishing Limited, Cambridge, UK, 2007

### SUPPLEMENTARY LITERATURE

1) różni autorzy, Cereal Chemistry (journal), wyd. Wiley, 2000-2018 ; 2) różni autorzy, Plant Foods For Human Nutrition (journal), wyd. Springer, 2000-2018 ; 3) różni autorzy, Trends in Food Science & Technology (journal), wyd. Elsevier, 2000-2018 ; 4) różni autorzy, Journal of Dairy Science (journal), wyd. Elsevier, 2000-2018

### Course / module

Fermented products in food and feed chain

### Fields of education:

Obszar nauk technicznych

**Course status:** facultative

**Course group:** C - przedmioty specjalnościowe

**ECTS code:**

**Field of study:** Environmental Engineering

**Specialty area:**

**Educational profile:** General academic

**Form of study:** Stacjonarne

**Level of study:** Drugiego stopnia/masters

**Year/Semester:** 1 / 1

### Type of course:

Laboratory classes, Lecture

**Number of hours per semester/week:** Laboratory classes: 15, Lecture: 5

### Teaching forms and methods

Laboratory classes(K1, U1, U2, W1, W2) : laboratory and practical exercises (evaluation and production of fermented products), Lecture(K1, W1) : multimedia lecture with discussion

### Form and terms of the verification results:

LABORATORY CLASSES: Evaluation of the work and cooperation in the group - Assessment of team work and commitment to exercise (10% of final grade)(K1, U2, W2) ;LABORATORY CLASSES: Write-up - Evaluation of the written report on the exercise (20% of the final grade)(U1, U2) ;LABORATORY CLASSES: Colloquium test - A test concerning issues covered in lectures and classes (70% of final grade)(K1, W1) ;LECTURE: Part in the discussion - Passing the lecture based on the student's presence at the lecture and active participation in it(W1)

**Number of ECTS points:** 1,5

**Language of instruction:** angielski

### Introductory courses:

-

### Preliminary requirements:

-

### Name of the organizational unit offering the course:

Katedra Technologii i Chemii Mięsa,

### Person in charge of the course:

dr hab. Monika Modzelewska-Kapituła,

### Course coordinators:

prof. dr hab. inż. Katarzyna Majewska, , dr hab. Monika Modzelewska-Kapituła, , dr hab. inż. Justyna Żulewska, prof. UWM

### Notes:

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## Detailed description of the awarded ECTS points - part B

**ECTS:1,5**  
**YEAR: 2018L**

### **FERMENTED PRODUCTS IN FOOD AND FEED CHAIN** **FERMENTED PRODUCTS IN FOOD AND FEED CHAIN**

The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

- participation in: laboratory classes	15 h
- participation in: lecture	5 h
- consultation	1 h
	21 h

2. Student's independent work:

- preparation for proceeding the trials	3 h
- preparation for the test	6 h
	9 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 30 h : 30 h/ECTS = 1,00 ECTS  
average: **1,5 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher:	0,70 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work:	0,80 ECTS points,



ECTS: 1,5  
YEAR: 2018L

## FOOD AND BIOPROCESS ENGINEERING FOOD AND BIOPROCESS ENGINEERING

### COURSE CONTENT CLASSES:

Evaluation of the parameters influencing the synthesis of yeast biomass. Analysis of parameters influencing the synthesis of lipids and/or proteins by microorganisms and/or algae. Separation and purification of intra- and extracellular metabolites. Immobilization of cells and enzymes. The application of lipases in ester synthesis. Production of low-lactose milk. Transgalactosylation activity of  $\beta$ -D-galactosidase. Properties of milk clotting enzymes.

### LECTURES:

Bioprocess technology for the production of cell biomass and primary/secondary metabolites, such as baker's yeast, ethanol, citric acid, amino acids, exopolysaccharides, antibiotics, biosurfactants, lipids, proteins, enzymes and pigments, etc. Microbial production, purification and bioprocess application of industrial enzymes. Kinetics of microbial growth, substrate utilization and product formation. Sterilization of air and media. Batch, fed-batch and continuous processes. Aeration and agitation. Mass transfer in bioreactors. Rheology of fermentation fluids. Scale-up concepts. Design of fermentation media. Various types of microbial and enzyme reactors. Instrumentation in bioreactors. Chromatographic and membrane based bioseparation methods. Immobilization of enzymes and cells and their application for bioconversion processes. Large-scale production and purification of bioproducts.

### EDUCATIONAL OBJECTIVE:

This course presents the classical and modern applications of microorganisms and enzymes in food processing and food product synthesis, including synthesis and modification of food compounds by microorganisms and enzymes. Both individual activity and cooperation with group members will be assessed.

### DESCRIPTION OF LEARNING OUTCOMES FOR THE COURSE IN REALATION TO FIELD AND MAJOR LEARNING OUTCOMES

Codes of learning outcomes in a major field of study: T2A\_K01+, T2A\_K02+, T2A\_K05+++, T2A\_K07+++, T2A\_U01+, T2A\_U08+, T2A\_U10+, T2A\_U11+, T2A\_U15++, T2A\_U16+, T2A\_U18+, T2A\_W02+++, T2A\_W05+, T2A\_W06++, T2A\_W08+

Codes of learning outcomes in a major area of study: K2\_K01+, K2\_K02+++, K2\_K03+, K2\_U01+, K2\_U06+, K2\_U08+, K2\_U10+, K2\_U15+, K2\_W05+++, K2\_W06+, K2\_W07+, K2\_W10++

### LEARNING OUTCOMES:

#### Knowledge

- W1 - The students will gain sufficient of biotechnology vocabulary to enable effective communication with practitioners in a diverse range of literate fields, including food technology, food biotechnology
- W2 - Acquire a general knowledge to understand microbial, enzymatic processes
- W3 - Acquire insight into how processes could be improved by using biotechnological methods
- W4 - Acquire fundamental knowledge of biotechnology application

#### Skills

- U1 - Be able to critically evaluate biotechnology concepts
- U2 - Acquire knowledge of basic approaches to apply bioprocesses
- U3 - Demonstrate understanding of enzymes assay and microorganisms cultivation

#### Social competence

- K1 - Understand the influence of biotechnology on products and environment
- K2 - Understand properties of enzymes and microorganisms in food
- K3 - Apply ethical principles and legislation to the area of biotechnology

### BASIC LITERATURE

- 1) Doran P.M., Bioprocess engineering principles, wyd. Academic Press, 2013 ; 2) Dunford N.Y., Kerr R.M., Food and Industrial Bioproducts and Bioprocessing, wyd. Wiley-Blackwell, 2012 ; 3) Whitaker J.R., Voragen A.G.J., Handbook of food enzymology, wyd. Marcel Dekker, Inc., 2003 ; 4) Neeser, J.-R., Bioprocesses and biotechnology for functional foods and nutraceuticals, wyd. Marcel Dekker, Inc. , 2004 ; 5) Clarke K.G., Bioprocess engineering. An introductory engineering and life science approach, wyd. Woodhead Publishing Limited, 2013 ; 6) Hou Ch.T., Handbook of industrial biocatalysis, wyd. Taylor&Francis, 2005

### SUPPLEMENTARY LITERATURE

### Course / module

Food and bioprocess engineering

### Fields of education:

Obszar nauk technicznych

**Course status:** facultative

**Course group:** C - przedmioty specjalnościowe

**ECTS code:**

**Field of study:** Environmental Engineering

**Specialty area:**

**Educational profile:** General academic

**Form of study:** Stacjonarne

**Level of study:** Drugiego stopnia/ masters

**Year/Semester:** 1 / 1

### Type of course:

Classes, Lecture

**Number of hours per semester/week:** Classes: 15, Lecture: 5

### Teaching forms and methods

Classes(K1, K2, K3, U1, U2, U3, W1, W2, W3, W4) : Recitation classes - Preparation and presentation of issues selected and recommended by leading, panel discussion  
Laboratory classes - Implementation and control of experiments corresponding to a subject, Lecture(W1, W2, W3, W4) : information lecture, problem lecture, conversation lecture

### Form and terms of the verification results:

CLASSES: Written test - Problematic questions(W1, W2, W3, W4) ;CLASSES: Evaluation of the work and cooperation in the group - Observation during classes(K1, K2, K3) ;CLASSES: Write-up - Description the results of the carried out experiments with conclusions(K1, K2, K3, U1, U2, U3) ;LECTURE: Written test - Problematic questions(W1, W2, W3, W4)

**Number of ECTS points:** 1,5

**Language of instruction:** angielski

**Introductory courses:**

**Preliminary requirements:**

**Name of the organizational unit offering the course:**

Katedra Biotechnologii Żywności,

**Person in charge of the course:**

dr hab. inż. Marek Adamczak, prof. UWM

**Course coordinators:**

dr hab. inż. Marek Adamczak, prof. UWM

**Notes:**

## Detailed description of the awarded ECTS points - part B

**ECTS:1,5**  
**YEAR: 2018L**

### **FOOD AND BIOPROCESS ENGINEERING** **FOOD AND BIOPROCESS ENGINEERING**

The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

- participation in: classes	15 h
- participation in: lecture	5 h
- consultation	1 h
	21 h

2. Student's independent work:

-	8 h
-	4 h
-	12 h
	24 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 45 h : 30 h/ECTS = 1,50 ECTS  
average: **1,5 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher:	0,70 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work:	0,80 ECTS points,



ECTS: 1,5  
YEAR: 2018L

## INNOVATION IN FOOD BIOTECHNOLOGY INNOVATION IN FOOD BIOTECHNOLOGY

### COURSE CONTENT CLASSES:

Preparation of liposomes, nanoliposomes, emulsions. Immobilization of cells and enzymes (carriers and noncarriers). The influence of high-pressure technology on the properties of food products. Biosynthesis of nanoparticles, their properties and application.

### LECTURES:

Progress in bioprocess technology for the production of cell biomass and primary/secondary metabolites. Molecular engineering techniques. Biodiversity and metagenome and directed evolution. Immobilization of enzymes and cells and their application for bioconversion processes. Large-scale production and purification of bioproducts. Nanobiotechnology. Nanomaterials. Liposomes, phytosomes, encapsulation. High pressure technology, pulsed electric field and cold plasma application. The application of biotechnology for waste and by-products from food industry valorization.

### EDUCATIONAL OBJECTIVE:

This course presents the modern applications of microorganisms and enzymes in food processing and food product synthesis, including the analysis of the modification of food compounds by microorganisms and enzymes. The basic molecular biology and nano(bio)technology approaches are presented, including sustainable technology for waste and by-product utilization and bioprocess engineering. High pressure technology in food production. Both individual activity and cooperation with group members will be assessed. Innovation in industrial application of biotechnology.

### DESCRIPTION OF LEARNING OUTCOMES FOR THE COURSE IN REALATION TO FIELD AND MAJOR LEARNING OUTCOMES

Codes of learning outcomes in a major field of study:

T2A\_K01+, T2A\_K07+++, T2A\_U01+++, T2A\_U10+, T2A\_U15+, T2A\_W02+++, T2A\_W05+++, T2A\_W06++, T2A\_W08+++,

Codes of learning outcomes in a major area of study:

K2\_K02+++, K2\_K03+, K2\_U01+++, K2\_U07+, K2\_U08+, K2\_W05+++, K2\_W10++, K2\_W17+++,

### LEARNING OUTCOMES:

#### Knowledge

- W1 - The students will gain sufficient of biotechnology vocabulary to enable effective communication with practitioners in a diverse range of literate fields, including food technology, food biotechnology
- W2 - Acquire a general knowledge to understand microbial, enzymatic processes
- W3 - Acquire insight into how processes could be improved by using biotechnological methods
- W4 - Acquire fundamental knowledge of biotechnology application

#### Skills

- U1 - Be able to critically evaluate biotechnology concepts
- U2 - Acquire knowledge of basic approaches to apply bioprocesses
- U3 - Demonstrate understanding of enzymes assay and microorganisms cultivation

#### Social competence

- K1 - Understand the influence of biotechnology on products and environment
- K2 - Understand properties of enzymes and microorganisms in food
- K3 - Apply ethical principles and legislation to the area of biotechnology

### BASIC LITERATURE

- 1) Perry Johnson-Green, Introduction to Food Biotechnology, wyd. CRC Series, Series: Contemporary Food Science, 2002 ; 2) Byong H. Lee, Fundamentals of Food Biotechnology, wyd. John Wiley & Sons, Ltd., 2015 ; 3) Different authors, Articles from journal Food Biotechnology: <http://www.tandfonline.com/toc/lfbt20/current>, wyd. Taylor & Francis, All ; 4) Anthony Pometto, Kalidas Shetty, Gopinadhan Paliyath, Robert E. Levin , Food Biotechnology, Second Edition, wyd. CRC Press, 2005 ; 5) Stahl, Ulf, Donalies, Ute E.B., Nevoigt, Elke (Eds.), Food Biotechnology, wyd. Springer, 2008 ; 6) Gustavo F. Gutierrez-Lopez, Food Science and Food Biotechnology, wyd. CRC Press, 2003 ; 7) Casimir C. Akoh, Food Lipids: Chemistry, Nutrition, and Biotechnology, Fourth Edition, wyd. CRC Press, 2017 ; 8) Ravishankar Rai V (Editor), Advances in Food Biotechnology, wyd. Wiley, 2015 ; 9) Debasis Bagchi, Francis C. Lau, Dilip K. Ghosh, Biotechnology in Functional Foods and Nutraceuticals, wyd. CRC Press, 2010 ; 10) Didier Montet, Ramesh C. Ray, Fermented Foods, Part I: Biochemistry and Biotechnology, wyd. CRC Press, 2015 ; 11) Ching T. Hou, Jei-Fu Shaw, Biocatalysis and Biotechnology for Functional Foods and Industrial Products, wyd. CRC Press, 2005 ; 12) Claudio Nicolini, Nanobiotechnology and Nanobiosciences, wyd. Pan Stanford, 2008 ; 13) Ching T. Hou, Handbook of Industrial Biocatalysis, wyd. CRC Press, 2008

### SUPPLEMENTARY LITERATURE

<b>Course / module</b>	Innovation in food biotechnology
<b>Fields of education:</b>	Obszar nauk technicznych
<b>Course status:</b>	facultative
<b>Course group:</b>	C - przedmioty specjalnościowe
<b>ECTS code:</b>	
<b>Field of study:</b>	Environmental Engineering
<b>Specialty area:</b>	
<b>Educational profile:</b>	General academic
<b>Form of study:</b>	Stacjonarne
<b>Level of study:</b>	Drugiego stopnia/ masters
<b>Year/Semester:</b>	1 / 1
<b>Type of course:</b>	Classes, Lecture
<b>Number of hours per semester/week:</b>	Classes: 15, Lecture: 5
<b>Teaching forms and methods</b>	Classes(K1, K2, K3, U1, U2, U3, W1, W2, W3, W4) : Recitation classes - Preparation and presentation of issues selected and recommended by leading, panel discussion Laboratory classes - Implementation and control of experiments corresponding to a subject, Lecture(W1, W2, W3, W4) : Information lecture, problem lecture, conversation lecture
<b>Form and terms of the verification results:</b>	CLASSES: Written test - Problematic questions(W1, W2, W3, W4) ;CLASSES: Evaluation of the work and cooperation in the group - Observation during classes(K1, K2, K3) ;CLASSES: Write-up - Description the results of the carried out experiments with conclusions(K1, K2, K3, U1, U2, U3) ;LECTURE: Written test - Problematic questions(W1, W2, W3, W4)
<b>Number of ECTS points:</b>	1,5
<b>Language of instruction</b>	angielski
<b>Introductory courses:</b>	
<b>Preliminary requirements:</b>	
<b>Name of the organizational unit offering the course:</b>	Katedra Biotechnologii Żywności,
<b>Person in charge of the course:</b>	dr hab. inż. Marek Adamczak, prof. UWM
<b>Course coordinators:</b>	dr hab. inż. Marek Adamczak, prof. UWM
<b>Notes:</b>	

## Detailed description of the awarded ECTS points - part B

**ECTS:1,5**  
**YEAR: 2018L**

### **INNOVATION IN FOOD BIOTECHNOLOGY** **INNOVATION IN FOOD BIOTECHNOLOGY**

The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

- participation in: classes	15 h
- participation in: lecture	5 h
- consultation	1 h
	21 h

2. Student's independent work:

-	12 h
-	8 h
-	4 h
	24 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 45 h : 30 h/ECTS = 1,50 ECTS  
average: **1,5 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher:	0,70 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work:	0,80 ECTS points,



**ECTS: 3**  
**YEAR: 2018L**

## INTRODUCTION TO FOOD BIOTECHNOLOGY

### INTRODUCTION TO FOOD BIOTECHNOLOGY

#### COURSE CONTENT

##### CLASSES:

Evaluation of the parameters influencing the synthesis of yeast biomass. Analysis of parameters influencing the synthesis of bioproducts, e.g. lipids and/or proteins by microorganisms and algae. Separation and purification of intra- and extracellular metabolites. The application of lipases in ester synthesis. Production of low-lactose milk. Transgalactosylation activity of  $\beta$ -D-galactosidase. Properties of milk clotting enzymes.

##### LECTURES:

Bioprocess technology for the production of cell biomass and primary/secondary metabolites, such as baker's yeast, ethanol, citric acid, amino acids, exo-polysaccharides, antibiotics, biosurfactants, lipids, proteins, enzymes and pigments, etc. Microbial production, purification and bioprocess application of industrial enzymes. Kinetics of microbial growth, substrate utilization and product formation. Sterilization of air and media. Batch, fed-batch and continuous processes. Aeration and agitation. Mass transfer in bioreactors. Rheology of fermentation fluids. Scale-up concepts. Design of fermentation media. Various types of microbial and enzyme reactors. Instrumentation in bioreactors. Chromatographic and membrane based bioseparation methods. Immobilization of enzymes and cells and their application for bioconversion processes. Large-scale production and purification of bioproducts.

##### EDUCATIONAL OBJECTIVE:

This course presents the classical applications of microorganisms and enzymes in food processing and food product synthesis, including the analysis of the modification of food compounds by microorganisms and enzymes. The synthesis of enzymes and bioproducts by microorganisms will be presented. Both individual activity and cooperation with group members will be assessed.

#### DESCRIPTION OF LEARNING OUTCOMES FOR THE COURSE IN REALATION TO FIELD AND MAJOR LEARNING OUTCOMES

Codes of learning outcomes in a major field of study:	T2A_K01+, T2A_K05+++, T2A_K07+++, T2A_U01+, T2A_U10+, T2A_U15+++, T2A_W02+++, T2A_W05+++, T2A_W08+++,
Codes of learning outcomes in a major area of study:	K2_K02+++, K2_K03+, K2_U01++, K2_U08+++, K2_W05+++, K2_W17+++,

##### LEARNING OUTCOMES:

###### Knowledge

W1 - The students will gain sufficient of biotechnology vocabulary to enable effective communication with practitioners in a diverse range of literate fields, including food technology, food biotechnology  
W2 - Acquire a general knowledge to understand microbial, enzymatic processes  
W3 - Acquire insight into how processes could be improved by using biotechnological methods  
W4 - Acquire fundamental knowledge of biotechnology application

###### Skills

U1 - Be able to critically evaluate biotechnology concepts  
U2 - Acquire knowledge of basic approaches to apply bioprocesses  
U3 - Demonstrate understanding of enzymes assay and microorganisms cultivation

###### Social competence

K1 - Understand the influence of biotechnology on products and environment  
K2 - Understand properties of enzymes and microorganisms in food  
K3 - Apply ethical principles and legislation to the area of biotechnology

#### BASIC LITERATURE

1) Perry Johnson-Green, Introduction to Food Biotechnology. Series: Contemporary Food Science, wyd. CRC Series, 2002; 2) Byong H. Lee, Fundamentals of Food Biotechnology, wyd. John Wiley & Sons, Ltd, 2015; 3) Different authors, Articles from journal Food Biotechnology: <http://www.tandfonline.com/toc/ffbt20/current>, wyd. Taylor & Francis, all; 4) Anthony Pometto, Kalidas Shetty, Gopinadhan Paliyath, Robert E. Levin, Food Biotechnology, Second Edition, wyd. CRC Press, 2005; 5) Stahl, Ulf, Donalies, Ute E.B., Nevoigt, Elke (Eds.), Food Biotechnology, wyd. Springer, 2008; 6) Gustavo F. Gutierrez-Lopez, Food Science and Food Biotechnology, wyd. CRC Press, 2003; 7) Casimir C. Akoh, Food Lipids: Chemistry, Nutrition, and Biotechnology, Fourth Edition, wyd. CRC Press, 2017

#### SUPPLEMENTARY LITERATURE

#### Course / module

Introduction to food biotechnology

#### Fields of education:

Obszar nauk technicznych

**Course status:** mandatory

**Course group:** A - przedmioty podstawowe

**ECTS code:**

**Field of study:** Environmental Engineering

**Specialty area:**

**Educational profile:** General academic

**Form of study:** Stacjonarne

**Level of study:** Drugiego stopnia/masters

**Year/Semester:** 1 / 1

#### Type of course:

Classes, Lecture

**Number of hours per semester/week:** Classes: 30, Lecture: 15

#### Teaching forms and methods

Classes(K1, K2, K3, U1, U2, U3, W1, W2, W3, W4) : Recitation classes - Preparation and presentation of issues selected and recommended by leading, panel discussion  
Laboratory classes - Implementation and control of experiments corresponding to a subject, Lecture(W1, W2, W3, W4) : information lecture, problem lecture, conversation lecture

#### Form and terms of the verification results:

CLASSES: Written test - Problematic questions(W1, W2, W3, W4) ;CLASSES: Evaluation of the work and cooperation in the group - Observation during classes(K1, K2, K3) ;CLASSES: Write-up - Description the results of the carried out experiments with conclusions(K1, K2, K3, U1, U2, U3) ;LECTURE: Written test - Problematic questions(W1, W2, W3, W4)

**Number of ECTS points:** 3

**Language of instruction:** angielski

**Introductory courses:**

**Preliminary requirements:**

**Name of the organizational unit offering the course:**

Katedra Biotechnologii Żywności,

**Person in charge of the course:**

dr hab. inż. Marek Adamczak, prof. UWM

**Course coordinators:**

dr hab. inż. Marek Adamczak, prof. UWM

**Notes:**

## Detailed description of the awarded ECTS points - part B

**ECTS:3**  
**YEAR: 2018L**

### **INTRODUCTION TO FOOD BIOTECHNOLOGY** **INTRODUCTION TO FOOD BIOTECHNOLOGY**

The awarded number of ECTS points is composed of:

#### 1. Contact hours with the academic teacher:

- participation in: classes	30 h
- participation in: lecture	15 h
- consultation	4 h
	49 h

#### 2. Student's independent work:

-	25 h
-	6 h
-	10 h
	41 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 90 h : 30 h/ECTS = 3,00 ECTS  
average: **3 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher:	1,63 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work:	1,37 ECTS points,



ECTS: 2  
YEAR: 2018L

**MOLECULAR BIOLOGY TECHNIQUES IN BIOTECHNOLOGY**  
**MOLECULAR BIOLOGY TECHNIQUES IN BIOTECHNOLOGY**

**COURSE CONTENT**  
**CLASSES:**

**LECTURES:**

**EDUCATIONAL OBJECTIVE:**

**DESCRIPTION OF LEARNING OUTCOMES FOR THE COURSE IN REALATION TO FIELD AND MAJOR LEARNING OUTCOMES**

Codes of learning outcomes in a major field of study: T2A\_K01+, T2A\_K02+, T2A\_K03+, T2A\_K04+, T2A\_K06+, T2A\_U02+, T2A\_U03+, T2A\_U04+, T2A\_U05+, T2A\_U06++, T2A\_W02++,

Codes of learning outcomes in a major area of study: K2\_K01+, K2\_K03+, K2\_U02+, K2\_U04+, K2\_U16+, K2\_W06++,

**LEARNING OUTCOMES:**

**Knowledge**

W1 - Students will learn principles of molecular biology, the properties of nucleic acids and proteins. Students will acquire the theoretical background of molecular techniques and omics and meta-omics approaches. Students will know methods of genetic engineering transformations and know how to produce heterologous proteins  
W2 - Students will know how to apply molecular techniques in biotechnology

**Skills**

U1 - Students will possess the skills of DNA purification, quantification and amplification  
U2 - Can use molecular biology techniques in genotyping  
U3 - Can write a report from the conducted experiments

**Social competence**

K1 - Is aware of the dangerous of using genetically modified organisms (GMO).  
K2 - Is aware of the need for learning throughout life

**BASIC LITERATURE**

1) Brown T.A., Gene Cloning and DNA Analysis: An Introduction, wyd. . Blackwell Science, 2001 , s. 363; 2) Nicholl D.S.T., An Introduction to Genetic Engineering, wyd. Cambridge University Press, 2002

**SUPPLEMENTARY LITERATURE**

**Course / module**  
Molecular biology techniques in biotechnology

**Fields of education:**

Obszar nauk technicznych

**Course status:** mandatory

**Course group:** B - przedmioty kierunkowe

**ECTS code:**

**Field of study:** Environmental Engineering

**Specialty area:**

**Educational profile:** General academic

**Form of study:** Stacjonarne

**Level of study:** Drugiego stopnia/ masters

**Year/Semester:** 1 / 1

**Type of course:**

Laboratory classes, Lecture

**Number of hours per semester/week:** Laboratory classes: 20, Lecture: 10

**Teaching forms and methods**

Laboratory classes(U1, U2, U3) ; ,  
Lecture(K1, K2, W1, W2) :

**Form and terms of the verification results:**

LABORATORY CLASSES: Report - null(U2, U3) ;LABORATORY CLASSES: Colloquium test - null(K1, K2, U1, W1, W2) ;LECTURE: Colloquium test - null(K1, K2, U1, W1, W2)

**Number of ECTS points:** 2

**Language of instruction** polski

**Introductory courses:**

**Preliminary requirements:**

**Name of the organizational unit offering the course:**

Katedra Biotechnologii w Ochronie Środowiska,

**Person in charge of the course:**

dr hab. Sławomir Ciesielski, prof. UWM

**Course coordinators:**

dr hab. Sławomir Ciesielski, prof. UWM, dr inż. Dariusz Kaczmarczyk, , dr inż. Maciej Woźny, , Mohammed Alhamarna,

**Notes:**

brak



## Detailed description of the awarded ECTS points - part B

**ECTS:2**  
**YEAR: 2018L**

### **MOLECULAR BIOLOGY TECHNIQUES IN BIOTECHNOLOGY** **MOLECULAR BIOLOGY TECHNIQUES IN BIOTECHNOLOGY**

The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

- participation in: laboratory classes	20 h
- participation in: lecture	10 h
- consultation	2 h
	32 h

2. Student's independent work:

0 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 32 h : 30 h/ECTS = 1,07 ECTS  
average: **2 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 1,07 ECTS points,  
- including the number of ECTS points for hours completed in the form of the student's independent work: 0,93 ECTS points,



ECTS: 1,5  
YEAR: 2018L

## REUSE AND RECYCLING OF SOLID WASTE REUSE AND RECYCLING OF SOLID WASTE

### COURSE CONTENT CLASSES:

### LECTURES:

### EDUCATIONAL OBJECTIVE:

### DESCRIPTION OF LEARNING OUTCOMES FOR THE COURSE IN REALATION TO FIELD AND MAJOR LEARNING OUTCOMES

Codes of learning outcomes in a major field  
of study:

T2A\_K01+, T2A\_K02+, T2A\_K03+, T2A\_K04+, T2A\_K05+,  
T2A\_K06+, T2A\_K07+, T2A\_U02+, T2A\_U03+, T2A\_U04++,  
T2A\_U05+, T2A\_U06++, T2A\_U10++, T2A\_U11+, T2A\_U14+,  
T2A\_U16+, T2A\_U17+, T2A\_U18+, T2A\_U19++, T2A\_W02+,  
T2A\_W04+, T2A\_W05+, T2A\_W08++,

Codes of learning outcomes in a major area  
of study:

K2\_K01+, K2\_K02+, K2\_K03+, K2\_U02+, K2\_U04+, K2\_U10+,  
K2\_U13+, K2\_U14+, K2\_U15+, K2\_U16+, K2\_W05+, K2\_W07+,  
K2\_W11+,

### LEARNING OUTCOMES:

#### Knowledge

- W1 - Characteristics and the scope of issues related to the recycling and disposal of solid waste
- W2 - Defining and recognizing the desirability of using technologies and bio-technologies of waste recycling and disposal depending on the quantity and quality of solid waste
- W3 - Integration of knowledge in the field of recycling and biotechnology of solid waste

#### Skills

- U1 - Evaluation of the technologies and biotechnologies and the adjustment of the priorities in the management of solid waste, analyzes of the properties of solid waste, selection of the technological and biotechnological solutions depending on the quantity and quality of waste and strategy
- U2 - Preparation of the concept of solid waste recycling and disposal taking into account legal regulations regarding the treatment and disposal of solid waste
- U3 - Expectations and the effects in relation to the proposed solutions for the recycling and disposal of solid waste

#### Social competence

- K1 - Is aware of the importance of technologies to prevent environmental degradation. Willingness to cooperate in a team and orientation for their own intellectual development
- K2 - Is aware of the need for learning throughout life. Understands the need to use principles of sustainable development in environmental engineering

### BASIC LITERATURE

- 1) edited by Lens P., Hamelers B., Hoitink H., Bidlingmaier W., Resource, recovery and reuse in organic solid waste management, wyd. TJ International Padstow, Cornwall, UK., 2004

### SUPPLEMENTARY LITERATURE

- 1) different authors, Materials supported by the teacher, wyd. various magazines, 2017-2018

### Course / module

Reuse and recycling of solid waste

### Fields of education:

Obszar nauk technicznych

**Course status:** facultative

**Course group:** C - przedmioty specjalnościowe

**ECTS code:**

**Field of study:** Environmental Engineering

**Specialty area:**

**Educational profile:** General academic

**Form of study:** Stacjonarne

**Level of study:** Drugiego stopnia/ masters

**Year/Semester:** 1 / 1

### Type of course:

Lecture, Project classes

**Number of hours per semester/week:** Lecture: 5, Project classes: 15

### Teaching forms and methods

Lecture(W1, W2, W3) : , Project classes(K1, K2, U1, U2, U3) :

### Form and terms of the verification results:

LECTURE: Colloquium test - null(U2, U3, W1, W2, W3) ;PROJECT CLASSES: Project - null(K1, K2, U1)

**Number of ECTS points:** 1,5

**Language of instruction:** angielski

### Introductory courses:

### Preliminary requirements:

### Name of the organizational unit offering the course:

Katedra Biotechnologii w Ochronie Środowiska,

### Person in charge of the course:

dr hab. inż. Katarzyna Bernat,

### Course coordinators:

### Notes:

brak

## Detailed description of the awarded ECTS points - part B

**ECTS:1,5**  
**YEAR: 2018L**

### **REUSE AND RECYCLING OF SOLID WASTE** **REUSE AND RECYCLING OF SOLID WASTE**

The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

- participation in: project classes	15 h
- participation in: lecture	5 h
- consultation	1 h
	21 h

2. Student's independent work:

0 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 21 h : 30 h/ECTS = 0,70 ECTS  
average: **1,5 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 0,70 ECTS points,  
- including the number of ECTS points for hours completed in the form of the student's independent work: 0,80 ECTS points,



**ECTS:**  
**YEAR: 2018L**

**TOXIC CHEMICAL RISK**  
**TOXIC CHEMICAL RISK**

**COURSE CONTENT**  
**CLASSES:**

**LECTURES:**

**EDUCATIONAL OBJECTIVE:**

**DESCRIPTION OF LEARNING OUTCOMES FOR THE COURSE IN REALATION TO FIELD AND MAJOR LEARNING OUTCOMES**

Codes of learning outcomes in a major field of study: T2A\_K01+, T2A\_K02+, T2A\_K03+, T2A\_K04+, T2A\_K05+, T2A\_K06+, T2A\_K07+, T2A\_U02+, T2A\_U03+, T2A\_U04+, T2A\_U05+, T2A\_U06+, T2A\_U08+, T2A\_U09+, T2A\_W01+,

Codes of learning outcomes in a major area of study: K2\_K01+, K2\_K02+, K2\_K03+, K2\_U02+, K2\_U04+, K2\_U06+, K2\_U09+, K2\_U16+, K2\_W02+,

**LEARNING OUTCOMES:**

**Knowledge**

W1 - Student describes the selected pollutants and explains their toxic effects at different levels of biological organization. Student describes toxic chemical risk to human health and the environment

**Skills**

U1 - Student classifies different responses of organisms and formulates simple hypotheses concerning the toxicity of selected contaminants. The student interprets the results obtained from the experiments carried out by the use of gained knowledge of the natural sciences and engineering. The student assesses toxic chemical risk to the environment. The student has the skills to operate basic equipment of the molecular biology lab

**Social competence**

K1 - Student demonstrates an active attitude with respect to the local and global environmental problems. The student cooperates with other students in a scientific experiment. Students update their knowledge from ecotoxicology, molecular toxicology and environmental statistics and knows its practical application in environmental risk assessment and management

**BASIC LITERATURE**

1) Penningroth, S., Essentials of toxic chemical risk-science and society., wyd. CRC Press, 2010, s. 1-194; 2) Walker C. H., Hopkin S. P., Sibly R. M., Peakall B., Principles of Ecotoxicology, wyd. Third Edition. CRC Press, 2005; 3) McCarthy J.F., Shugart L.R., Biomarkers of environmental contamination, wyd. Lewis Publishers, 1990; 4) Brown T.A., Genomes 3, wyd. Garland Science Publishing, 2007; 5) Brzuzan P., Woźny M., Toxicology. Student's coursebook., wyd. Department of Environmental Biotechnology, University of Warmia and Mazury in Olsztyn, Poland, 2012

**SUPPLEMENTARY LITERATURE**

1)

<b>Course / module</b>	Toxic chemical risk
<b>Fields of education:</b>	Obszar nauk technicznych
<b>Course status:</b>	facultative
<b>Course group:</b>	C - przedmioty specjalnościowe
<b>ECTS code:</b>	
<b>Field of study:</b>	Environmental Engineering
<b>Specialty area:</b>	
<b>Educational profile:</b>	General academic
<b>Form of study:</b>	Stacjonarne
<b>Level of study:</b>	Drugiego stopnia/ masters
<b>Year/Semester:</b>	1 / 1
<b>Type of course:</b>	Lecture, Project classes
<b>Number of hours per semester/week:</b>	Lecture: 5, Project classes: 15
<b>Teaching forms and methods</b>	Lecture(K1, U1, W1) ; Project classes(K1, U1, W1) :
<b>Form and terms of the verification results:</b>	LECTURE: Colloquium test - null(K1, U1, W1) ;PROJECT CLASSES: Report - null(K1, U1, W1)
<b>Number of ECTS points:</b>	
<b>Language of instruction</b>	angielski
<b>Introductory courses:</b>	
<b>Preliminary requirements:</b>	
<b>Name of the organizational unit offering the course:</b>	Katedra Biotechnologii w Ochronie Środowiska,
<b>Person in charge of the course:</b>	prof. dr hab. Paweł Brzuzan,
<b>Course coordinators:</b>	
<b>Notes:</b>	brak

## Detailed description of the awarded ECTS points - part B

**ECTS:**  
**YEAR: 2018L**

### **TOXIC CHEMICAL RISK** **TOXIC CHEMICAL RISK**

The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

- participation in: project classes	15 h
- participation in: lecture	5 h
- consultation	1 h
	21 h

2. Student's independent work:

0 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 21 h : 30 h/ECTS = 0,70 ECTS  
average: **ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher:	0,70 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work:	-0,70 ECTS points,



**WRITING SCIENTIFIC PAPERS**  
**WRITING SCIENTIFIC PAPERS**

**ECTS: 2**  
**YEAR: 2018L**

**COURSE CONTENT**  
**CLASSES:**

**LECTURES:**

**EDUCATIONAL OBJECTIVE:**

**DESCRIPTION OF LEARNING OUTCOMES FOR THE COURSE IN REALATION TO FIELD AND MAJOR LEARNING OUTCOMES**

Codes of learning outcomes in a major field of study: T2A\_K01+, T2A\_K02+, T2A\_K03+, T2A\_K04+, T2A\_K06+, T2A\_U01+, T2A\_U03+, T2A\_U04+, T2A\_U10+, T2A\_W05+, T2A\_W10+,

Codes of learning outcomes in a major area of study: K2\_K01+, K2\_K03+, K2\_U01+, K2\_U03+, K2\_W15+, K2\_W17+,

**LEARNING OUTCOMES:**

**Knowledge**

W1 - Knowledge of the principles of the preparation, presentation and writing scientific publications

W2 - Knowledge of specialty

**Skills**

U1 - Presentation (oral and written) in English rules of writing, publishing and presenting scientific papers

U2 - Practical rules of writing and presenting scientific papers (publication, poster, presentation)

**Social competence**

K1 - Creativity in scientific work; proactive in expressing evaluations; willingness to cooperate in a team; aware of the continuous growth of knowledge and progress methodically

K2 - Orientation for their own intellectual development; proceedings in accordance with the rules of ethics

**BASIC LITERATURE**

1) Łuczynski M., Writing Scientific Papers, wyd. Materials for internal use at the Department of Environmental Biotechnology. Available in electroni, 2016

**SUPPLEMENTARY LITERATURE**

**Course / module**

Writing scientific papers

**Fields of education:**

Obszar nauk technicznych

**Course status:** mandatory

**Course group:** O - przedmioty kształcenia ogólnego

**ECTS code:**

**Field of study:** Environmental Engineering

**Specialty area:**

**Educational profile:** General academic

**Form of study:** Stacjonarne

**Level of study:** Drugiego stopnia/ masters

**Year/Semester:** 1 / 1

**Type of course:**

Auditorium classes

**Number of hours per semester/week:** Auditorium classes: 30

**Teaching forms and methods**

Auditorium classes(K1, K2, U1, U2, W1, W2) :

**Form and terms of the verification results:**

AUDITORIUM CLASSES: Colloquium test - null(K1, K2, U1, U2, W1, W2)

**Number of ECTS points:** 2

**Language of instruction** angielski

**Introductory courses:**

**Preliminary requirements:**

**Name of the organizational unit offering the course:**

Katedra Biotechnologii w Ochronie Środowiska,

**Person in charge of the course:**

dr hab. inż. Agnieszka Cydzik-Kwiatkowska,

**Course coordinators:**

dr hab. inż. Agnieszka Cydzik-Kwiatkowska,

**Notes:**

brak

## Detailed description of the awarded ECTS points - part B

**ECTS:2**  
**YEAR: 2018L**

### **WRITING SCIENTIFIC PAPERS** **WRITING SCIENTIFIC PAPERS**

The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

- participation in: auditorium classes	30 h
- consultation	2 h
	32 h

2. Student's independent work:

0 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 32 h : 30 h/ECTS = 1,07 ECTS  
average: **2 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher:	1,07 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work:	0,93 ECTS points,