UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

of Environmental Sciences

A list of syllabus subjects

Field of study

Environmental Engineering

Speciality area

Environmental Biotechnology

Level of study

second degree studies

Programm code

4904-BS-A_KRK

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

13049-20-B
ECTS: 2
YEAR: 2018L

ANALYTICAL TECHNIQUES
ANALYTICAL TECHNIQUES

COURSE CONTENT
CLASSES:

State Environmental Monitoring - definition, objectives, structure and tasks. Measurements to assess the quality of soil and water. Chemical analysis of water quality using spectrophotometric and titration methods. Application of advanced analytical methods (microwave extraction/mineralization, high pressure liquid chromatography, flame atomic absorption spectrometry) in determination of pollutants concentration in soil. Statistical analysis of monitored data.

LECTURES:

none

EDUCATIONAL OBJECTIVE:

A student will have knowledge of the principles of determination chemical parameters in environmental samples, i.e. water, wastewater and soil. He will know the manners of sample preparation for analysis.

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_U06+, T2A_W01+, T2A_W02+, T2A_W08+,
Codes of learning outcomes in a major area of study:	K2_K01+, K2_K03+, K2_U02+, K2_U16+, K2_W02+, K2_W06+, K2_W16+,

LEARNING OUTCOMES:

Knowledge

W1 - A student will have knowledge of the State Environmental Monitoring, the principles of determination pollutants in environmental samples, i.e. water and soil
W2 - A student will have the knowledge how to determine the concentration of contaminations in environment and interpret the monitoring data

Skills

U1 - A student will be able to perform chemical analysis of environmental samples, calculate concentration of selected parameters and express them in suitable units

Social competence

K1 - A student will understand the importance of analytical methods in monitoring the quality of the environment. They will determine priorities for achieving these objectives
K2 - A student will gain experience of working as an active team member

BASIC LITERATURE

1) Hage D. S., Carr J.R. , Analytical Chemistry and Quantitative Analysis, wyd. Prentice Hall, 2010 ; 2) Baker R., Chemical Analysis in the Laboratory, wyd. Royal Society of Chemistry, 2002 ; 3) Fifield F.W., Haines P.J., Environmental Analytical Chemistry, wyd. Blackwell Science, 2000 ; 4) American Public Health Association (APHA), Standard Methods for the Examination of Water and Wastewater, wyd. American Public Health Association, Washington, DC, 1992

SUPPLEMENTARY LITERATURE

1) Ellison S.L.R., Barwick V.J., Farrant T.J.D., Practical Statistics for the Analytical Scientist: A Bench Guide, wyd. Royal Society of Chemistry, 2009 ; 2) VanLoon G.W., Duffy S.J., Environmental Chemistry: A global perspective, wyd. OUP Oxford, 2010 ; 3) Spiro T.G., Stigliani W.M., Chemistry of the Environment. 2nd Edition, wyd. Prentice Hall, Inc, 2003

Course / module
Analytical techniques
Fields of education:
Obszar nauk technicznych

Course status:	mandatory
Course group:	B - przedmioty kierunkowe
ECTS code:	13049-20-B
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	1 / 1

Type of course:
Laboratory classes

Number of hours per semester/week:	Laboratory classes: 30

Teaching forms and methods
Laboratory classes(K1, K2, U1, W1, W2) : Laboratory reports and test. Final mark consists of 40% of reports and 60% of test.

Form and terms of the verification results:
LABORATORY CLASSES: Colloquium test - Test(W1, W2) ;LABORATORY CLASSES: Report - After the laboratory exercise, student have to prepare a report(K1, K2, U1)

Number of ECTS points:	2
Language of instruction	polski

Introductory courses:
organic chemistry
Preliminary requirements:
none

Name of the organizational unit offering the course:
Katedra Biotechnologii w Ochronie Środowiska,
Person in charge of the course:
dr inż. Katarzyna Bułkowska,
Course coordinators:

Notes:
brak

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Detailed description of the awarded ECTS points - part B

13049-20-B
ECTS:2
YEAR: 2018L

ANALYTICAL TECHNIQUES
ANALYTICAL TECHNIQUES

The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

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

2. Student's independent work:

-	8 h
-	10 h
	18 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 50 h : 25 h/ECTS = 2,00 ECTS
average: **2 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 1,28 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 0,72 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

15049-24-C
ECTS: 2
YEAR: 2018L

COMMUNICATION SKILLS
COMMUNICATION SKILLS

COURSE CONTENT
CLASSES:

Being present and paying attention workshops. Storytelling techniques. Haiku writing. Preparing for and interview.

LECTURES:

Presence and creativity definition. Ten active communicating skills and definitions Four universal communication principles The ways of presentation of "personal id". Storytelling training. Preparation for talks. The tools of effective "self-presentation".

EDUCATIONAL OBJECTIVE:

The aim of learning is gaining by student the communication skills in the area of public speeches, the opinion and idea presentation and soft skills for group working

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_U05+, T2A_W02+, T2A_W08+,
Codes of learning outcomes in a major area of study:	K2_K02+, K2_K03+, K2_U02+, K2_W05+,

LEARNING OUTCOMES:

Knowledge

W1 - Student is gaining knowlegde in theoretical and practical leadership, effective presentation of ideas or different view points

Skills

U1 - Student is gaining active communication skills, knows how ideas, opinions should be presented, uses vebal and multimedial techniques of presentation tools, knows how to use nonverbal presentation techniques

Social competence

K1 - Student gains competences in effective communication, soft-skills for effective group working, playing different roles

BASIC LITERATURE

1) Harvard Business Review, Storytellling that moves people. A conversation with Screenwriting Coach Robert Mc Kee, wyd. Harvard Business Review, 2003, t. June, s. 5-8

SUPPLEMENTARY LITERATURE

Course / module
Communication skills

Fields of education:
Obszar nauk technicznych

Course status:	facultative
Course group:	C - przedmioty specjalnościowe
ECTS code:	15049-24-C
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	1 / 1

Type of course:
Lecture, Auditorium classes

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

Teaching forms and methods

Lecture(K1, W1) : problem lecture, multimedial presentation, Auditorium classes(K1, U1, W1) : practical workshops, panel discussion, presentation

Form and terms of the verification results:

LECTURE: Colloquium test - written test - open questions on the knowledge presented during lectures(K1, W1) ;AUDITORIUM CLASSES: Evaluation of the work and cooperation in the group - The ways of group members communication are evaluated(U1) ;AUDITORIUM CLASSES: Prezentation - Preparing presentations and clearance of given message are evaluated(K1, U1, W1) ;AUDITORIUM CLASSES: Part in the discussion - Discussion activity, clearance of message, self-presentation are evaluated. (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 Inżynierii Ochrony Wód,

Person in charge of the course:
dr inż. Renata Augustyniak,

Course coordinators:

Notes:

ECTS code: AAABB-CD-E_F

AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Detailed description of the awarded ECTS points - part B

15049-24-C
ECTS:2
YEAR: 2018L

COMMUNICATION SKILLS
COMMUNICATION SKILLS

The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

- participation in: auditorium classes	15 h
- participation in: lecture	15 h
- consultation	2 h
	32 h

2. Student's independent work:

-	14 h
-	4 h
	18 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 50 h : 25 h/ECTS = 2,00 ECTS
average: **2 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 1,28 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 0,72 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

06049-20-C
ECTS: 3
YEAR: 2018L

DESIGNING OF WASTEWATER TREATMENT SYSTEMS
DESIGNING OF WASTEWATER TREATMENT SYSTEMS

COURSE CONTENT
CLASSES:

LECTURES:

EDUCATIONAL OBJECTIVE:

The objective of the course is to deliver the knowledge for designing a biological wastewater treatment system.

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_K02+, T2A_K03+, T2A_K04+, T2A_K05+, T2A_K06+, T2A_K07+, T2A_U02+, T2A_U04+, T2A_U05+, T2A_W01+, T2A_W02+, T2A_W08+, T2A_W10+,
Codes of learning outcomes in a major area of study:	K2_K01+, K2_K02+, K2_U02+, K2_U13+, K2_W02+, K2_W05+, K2_W13+,

LEARNING OUTCOMES:

Knowledge

W1 - The student will: know the typical configuration of the wastwewater treatment. Understanding the principle of the biological methods of wastewater treatment. Familiar with biological processes like
W2 - Become familiar with the biological and chemical methods for phosporus removal. Knows the biological and chemical process for phoshorus remova
W3 - Understand the principle of the co-removal process of the emeriging contamination

Skills

U1 - The student will be able to choose proper solution of the biological system for wastewater treatment. Know how to design 1th , 2th, 3th stages of the activated sludge system; be able to design a nitrogen removal activated sludge system
U2 - The student will be able to design a phosphorus removal activated sludge system and chemical step for polishing the wastewater

Social competence

K1 - Understand the meaning of the biological principle for technical solutions
K2 - Knows how the importance of the link between biological and technical aspects in the case of new micro pollutants in wastewater

BASIC LITERATURE

1) McGraw-Hill , Wastewater Engineering (Treatment, Disposal, Reuse) , wyd. International Editions , 1991 ; 2) P. Aarne Vesilind et all, Wastewater treatment plant design , wyd. IWA Publishing , 2003 ; 3) H.J Jordning, J Winter Wiley-Vch , Environmental Biotechnology , wyd. Amazon, 2005

SUPPLEMENTARY LITERATURE

Course / module	
Designing of wastewater treatment systems	
Fields of education:	
Obszar nauk technicznych	
Course status:	mandatory
Course group:	C - przedmioty specjalnościowe
ECTS code:	06049-20-C
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	1 / 1
Type of course:	
Project classes	
Number of hours per semester/week:	Project classes: 45
Teaching forms and methods	
Project classes(K1, K2, U1, U2, W1, W2, W3) : classes with the use of a teaching device	
Form and terms of the verification results:	
PROJECT CLASSES: Written test - he course ends with an examination and grading, based on the partial grades for tests(K1, K2, U1, U2, W1, W2, W3)	
Number of ECTS points:	3
Language of instruction	angielski
Introductory courses:	
none	
Preliminary requirements:	
basic knowledge of mathematics, natural science, process engineering	
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:	
Notes:	
brak	

ECTS code: AAABB-CD-E_F

AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Detailed description of the awarded ECTS points - part B

06049-20-C
ECTS:3
YEAR: 2018L

DESIGNING OF WASTEWATER TREATMENT SYSTEMS
DESIGNING OF WASTEWATER TREATMENT SYSTEMS

The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

- participation in: project classes	45 h
- consultation	4 h
	49 h

2. Student's independent work:

- preparation to classes	16 h
- preparation to pass classes	10 h
	26 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 75 h : 25 h/ECTS = 3,00 ECTS
average: **3 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 1,96 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 1,04 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

ECOLOGICAL AND SOCIAL ASPECTS OF BIOTECHNOLOGY

ECTS: 2,5
YEAR: 2018L

COURSE CONTENT
CLASSES:

Ecology as a place for biotechnological techniques. Biotechnology as a tool in ecology and conservation of biodiversity. Problems in conservations of endangered species. Social aspects of conservation of the endangered species by using biotechnological techniques. The common fallacies of conservation programs and their consequences. Genetic diversity as a resource of populations and species that should be maintained. An biotechnological methods and techniques used in assessment of genetic diversity and comparison of their usefulness. Native or foe? the biotechnological techniques as a tool in identification the origin of populations and its social aspects. A modern ecological conservation, guideline how to conserve populations and species.

LECTURES:

Biotechlogical techniques as a tool identification the genetic differences between individuals, populations and species. How many molecular markers should we use for unbiased identification of genetic differences? How to pair the individuals for breeding in order to maximize a genetic variation in their progeny - practical exercise. The modern technique of genetic diversity preservation in banks of cryopreserved sperm - overview and key points. Assessment a genetic variation of investigated group of fish by using MSA and Arlequin software. Management of genetic variation by using Genassemblage software. The examples of applying a modern biotechnology techniques in conservation of land animals such; bison, lynx, mexican wolf, fish, and other water animals.

EDUCATIONAL OBJECTIVE:

Presentation the molecular techniques that are can be used in conservation of species that are endangered extinction and social aspects of conservation the biodiversity and conservation biology.

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_K02+, T2A_K03+, T2A_K04+, T2A_K05+, T2A_K06+, T2A_K07+, T2A_U01+, T2A_U09+, T2A_U10+, T2A_W01+, T2A_W02+, T2A_W03+,
Codes of learning outcomes in a major area of study:	K2_K01+, K2_K02+, K2_U01+, K2_U09+, K2_W01+, K2_W06+, K2_W09+,

LEARNING OUTCOMES:

Knowledge

W1 - The student will know what are the key points of reasonable consrvation programs and aplication of biotechnological techniques in field of molecular ecology
W2 - The student will konow what is genetic variation and why it is important for conservation of species microsatellite DNA, SNP, genetic profiling, criopreservation techniques and will able to read the information about genetic strusture of population and use them in modern ecology.
W3 - The student wil know what are PCR RFLP technigue, measurement a fragments of DNA usung automatic DNA sequncer, detection of SNP polymorphism and maintaining a genetic variation of human dependent population by apropirate pairing of individuals. The students will know the examples of use the techniques described during this course in conservation of endangered animal species

Skills

U1 - The student will be able to apply a techniques of molecular genetic in modern ecology, estimate a level of genetic variation within population and differences between populations and interpretate a indicators of genetic variation.
U2 - The student will be able to prepare a genetic profile of individuals intended to breading and use them in conservation of human dependant species. The student will be able to asses interpopulation deiversity and propose the method of maintainig it

Social competence

K1 - The students will find how important for the society is conservation of endangered species and why keeping biodiversity is important for the society
K2 - The student will value the importance of maintaining of genetic variation in conservation of species and be conscious how to increase a possibility of succes in conservation of biodiversity and reduce a cost of those procedures.

BASIC LITERATURE

1) Levin B., Genes , wyd. Pearson Prentice Hall, 2004, t. VIII, s. 1003; 2) Hartl D. E., Jones E. W, Genetics: Principles and Analysis, wyd. Jones and Bartlett Publishers, 1998 , s. 1298; 3) O'Connell M., Wright J.M. , Microsatellite DNA in Fishes, wyd. Reviews in Fish Biology and Fisheries, 1997, t. 7, s. 331-363

SUPPLEMENTARY LITERATURE

1) Kaczmarczyk D, Genassemblage software, a tool for management of genetic diversity in human dependent population, wyd. Conservation Genetic Resources, 2015, t. 3, s. 49-51; 2) Kaczmarczyk D, Wolnicki J., Genetic diversity of the endangered cyprinid fish lake minnow Eupallasella percnurus in Poland and its implications for conservation, wyd. PLoS One, 2016, t. 12, s. 1-16; 3) Spruell P., Hemingsen A.R., Howell P.J. Kana N. Allendorf F.W. , Conservation genetics of bull trout: Geographic distribution of microsatellite loci., wyd. Conservation

Course / module
Ecological and social aspects of biotechnology

Fields of education:
Obszar nauk technicznych

Course status:	facultative
Course group:	brak
ECTS code:	
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	1 / 1

Type of course:
Lecture, Auditorium classes

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

Teaching forms and methods
Lecture(K1, K2, U1, U2, W1, W2, W3) : information lecture, Auditorium classes(U1, U2, W2, W3) : seminar, project classes

Form and terms of the verification results:
LECTURE: Colloquium test - final test, problem questions that checks the overal orientation of student in the subject.(K1, K2, U1, U2, W1, W2, W3) ;AUDITORIUM CLASSES: Colloquium test - null(K1, K2, U1, U2, W1, W2, W3)

Number of ECTS points:	2,5
Language of instruction	angielski

Introductory courses:
no requirements

Preliminary requirements:
no requirements

Name of the organizational unit offering the course:
Katedra Biotechnologii w Ochronie Środowiska,

Person in charge of the course:
dr inż. Dariusz Kaczmarczyk,

Course coordinators:

Notes:
smal groups, laboratory classes

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

genetics, 2003, t. 4, s. 17-29; 4) Olech W, The influence of individual and maternal inbreeding on European bison (Bison bonasus) calves survival. Treatises and Monographs. , wyd. Wydawnictwo SGGW, Warszawa, 2003 ; 5) Ellegren H, Microsatellite evolution: a battle between replication slippage and point mutations, wyd. Trends in Genetics, 2002, t. 18, s. 2-70

Detailed description of the awarded ECTS points - part B

ECTS:2,5
YEAR: 2018L

ECOLOGICAL AND SOCIAL ASPECTS OF BIOTECHNOLOGY

The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

- participation in: auditorium classes	15 h
- participation in: lecture	15 h
- consultation	2 h
	32 h

2. Student's independent work:

- prepartation for tests	6 h
	6 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 38 h : 1 h/ECTS = 38,00 ECTS
average: **2,5 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher:	32,00 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work:	-29,50 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

06049-24-C
ECTS: 2
YEAR: 2018L

ECOLOGICAL ASPECTS OF BIOTECHNOLOGY
ECOLOGICAL ASPECTS OF BIOTECHNOLOGY

COURSE CONTENT
CLASSES:

Introcuction, rules, and organisation of classes. The technique of assesement the genetic variation based on polymorphism of microsatellite DNA and automatic DNA sequencer 3 Evaluation of genetic variation in (heterozygosity, allelic diversity, allelic richenes). Detection of individual genetic differences between populations. Estimation a genetic distance between fish from student's group and stock in breeding centre Rutki. 4 Example of construction and application genetic profile of fish spawners. Finding the best variant of male and female combination among groups of genetic profiles 5 Using the Genassemblage software for construction a optimal male/female pairing 6 Seminary nr. 1 Molecular markers as a tool in identyfication origin of population as well their interactions 7 Seminary nr 2. The programs of restitution and conservation of the bisons in Poland and lynx in Poland, bull trout 8 Test

LECTURES:

Introduction to the subject. Conservation ecology as a branch of modern ecology. Ecology as a coexistence of populations and relationship between them and environment. The basics of population genetics eg. selection, genetic drift and their consequences. Adaptation of populations to the environmental changes, stresses and anthropological changes. 2 Why many conservation programs are not successful? typical faults of conservation programs. How to conserve a species? What biotechnology techniques can be used in modern ecology? Biodiversity, genetic variation, human dependant species, inbreed, bottlenecks, founder effects. 3 Why and how the species and their populations differs between each other. What is genetic variation and how environmntal factors affect genetic variation (effective population size, genetic drift, selection, bottleneck effects founder effect. Genetic variation within and between populations. Why genetic variation is impotrant for conservatiom biology, How we can maintain a genetic variation ni populations and between them? 4 How we can estimate genetic variation within populations, and differences between populations? What is microsatelite DNA and polymorphism of SNP? How to use them as a markers of genetic variation. The steeps of the technique of assesement the genetic variation based on micorsatelllite DNA and SNP analysis. 5 A technique of assesement a genetic variation based on microsatellite DNA and SNP analysis how to solve a common problems, and FAQ. How many samples should be taken for analysis? Are those technique harmfull for the animals? To taging or not taging the animals? how many samples and markers should be used? Is it problem if groups of samples differs in size? What tissues are the best for extraction of DNA? Can we use a tissues taken from life museums? What are the best methods of preservation a tissues? What to do when is no available information about primers sequences neccesary for amplification a microsatellites ? Typical problems of PCR technique (primer-dimmer structures, null alleles,) A difficulties in measurement of DNA fragments lenght using automatic DNA sequencers (oversaturation, pulling up the signal dye by other burned out phosphoroamide dyes). Problems in data conversion a between imput files for software used. 6 What information about population and its history can we read from polymorphism of microsatellite DNA (changes in population size, similarity to other populations, presence of bottleneck effect, native or foe). How close related to each other are individuals consisting to investigated population. Where they came from? What are a chances of successful conservation of population. Import animals for enrich a genetic pool of conserved population or not? How to manage a genetic variation on within population and inter population level. What individuals are best to became a donor of gametes for cryopreservation. 7 Cryopreservation as a technique of conservation genetic variation. How can we use it in modern ecology? The banks of cryopreserved sperm as a remedy for some problems of conservation ecology. How to choose individuals for cryoconservation of sperm samples? How can we manage resources of genetic variation deposited in the banks of cryopreserved sperm? 8 The overview of bioinformatic software used in evaluation and management of genetic variation, detection of changes in population size, population structure and management the resources of genetic variation deposited in the banks of cryopreserved sperm.

EDUCATIONAL OBJECTIVE:

Students gain knowledge of biotechnological techniques and using them in the modern ecology

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_K05+, T2A_K07+, T2A_U07+, T2A_U09+, T2A_W02+, T2A_W03+,
Codes of learning outcomes in a major area of study:	K2_K02++, K2_U05+, K2_U09+, K2_W06+, K2_W09+,

LEARNING OUTCOMES:

Knowledge

W1 - The student will know what are the key points of reasonable consrvation programs. The student will know what biotechnological techniques can be use in molecular ecology. The student will konow what is genetic variation and why it is important for conservation of species. The student will know what is microsatellite DNA, SNP genetic profiling, and criopreservation techniques.
W2 - The student will know what information about genetic strusture of population can be read and how to use them in modern ecology. The student wil know what are PCR RFLP technigue, measurement a fragments of DNA usung automatic DNA sequncer, detection of SNP polymorphism and maintaining a genetic variation of human dependent population by apropirate pairing of individuals. The students will know the examples of use the techniques described during this course in conservation of endangered animal species.

Course / module
Ecological aspects of biotechnology

Fields of education:
Obszar nauk technicznych

Course status:	facultative
Course group:	C - przedmioty specjalnościowe
ECTS code:	06049-24-C
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	1 / 1

Type of course:
Lecture, Auditorium classes

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

Teaching forms and methods
Lecture(K1, K2, U2) : Informative classes, Auditorium classes(U1, W1, W2) : Informative lecture

Form and terms of the verification results:
LECTURE: Written test - Average from the tests(K1, K2, U1, U2, W1, W2) ;AUDITORIUM CLASSES: Colloquium test - Final test(K2, U2, W1, W2)

Number of ECTS points:	2
Language of instruction	angielski

Introductory courses:
no introductory courses

Preliminary requirements:
no introductory courses

Name of the organizational unit offering the course:
Katedra Biotechnologii w Ochronie Środowiska,

Person in charge of the course:
dr inż. Dariusz Kaczmarczyk,

Course coordinators:

Notes:
brak

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Skills

U1 - The student will be able to apply a techniques of molecular genetic in modern ecology. The student can estimate a level of genetic variation within population and differences between populations. The student will interpretate a indicators of genetic variation, and detect the factors that might affect the level of genetic variability in conserved population
U2 - The student will be able to prepare a genetic profile of individuals intended to breading and use them in conservation of human dependant species. The student will be able to asses interpopulation deiversity and propose the method of maintainig it.

Social competence

K1 - The student will value the importance of maintaining of genetic variation in conservation of species. The student will be conscious how to increase a possibility of succes in conservation of biodiversity and deduce a cost of those procedures.
K2 - The student will find a method of conservation of genetic variation in the human dependant population. The student will value a molecular genetic, cryoconservation of sperm samples and bioinformatic tools a methods of evaluation and maintaining the genetic variation . The student will be conscious a various grades of gnetic dfifferences existing among populations and will propose apropirate technique to protec a genetic diversity of the species.

BASIC LITERATURE

1) Olech W. , Conservation genetics of bull trout: Geographic distribution of microsatellite loci., wyd. Treatises and Monographs. Wydawnictwo SGGW, Warszawa Poland, 2003, t. 1, s. 87

SUPPLEMENTARY LITERATURE

1) Olech W. , Conservation genetics of bull trout: Geographic distribution of microsatellite loci., wyd. Treatises and Monographs. Wydawnictwo SGGW, Warszawa Poland, 2003, t. 1, s. 87; 2) Parsons D.R , “Green fire" returns to the southwest: reintroduction of the mexican wolf. , wyd. Journal of Wildlife Management , 1998, t. 26, s. 799-807; 3) Ellgren H., Microsatellite evolution: a battle between replication slippage and point mutations., wyd. Trends in Genetics, 2002, t. 18, s. 2-40; 4) O’Connell M., Wright J.M., Microsatellite DNA in Fishes, wyd. Reviews in Fish Biology and Fisheries, 1997, t. 7, s. 331-363

Detailed description of the awarded ECTS points - part B

06049-24-C
ECTS:2
YEAR: 2018L

ECOLOGICAL ASPECTS OF BIOTECHNOLOGY
ECOLOGICAL ASPECTS OF BIOTECHNOLOGY

The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

- participation in: auditorium classes	15 h
- participation in: lecture	15 h
- consultation	2 h
	32 h

2. Student's independent work:

- preparation and persentation a subjects indicated by the teacher.	8 h
- preparation for tests	4 h
- prepararation for final test	6 h
	18 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 50 h : 25 h/ECTS = 2,00 ECTS
average: **2 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 1,28 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 0,72 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

06049-24-C
ECTS: 2
YEAR: 2018L

INFORMATIVE TECHNIQUES IN ENVIRONMENTAL BIOTECHNOLOGY
INFORMATIVE TECHNIQUES IN ENVIRONMENTAL 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_U01+, T2A_U03++, T2A_U04++, T2A_U06+, T2A_U10+, T2A_W01+, T2A_W05+,
Codes of learning outcomes in a major area of study:	K2_K03+, K2_U01+, K2_U03+, K2_U04+, K2_W01+, K2_W17+,

LEARNING OUTCOMES:

Knowledge

W1 - The student will know how useful in current biotechnology and molecular genetic are bioinformatics techniques
W2 - The student will know how important are using them in various areas of molecular genetic. The student will know what are the contributions of using a bioinformatics tools in conservation genetic or other fields of biological sciences

Skills

U1 - The student can find and design a set or sets of primers for amplify a DNA fragments by using PCR technique. The student can read and evaluate the results of sequencing, SNP analysis. The student can convert a type of input file between various computer tools applied in molecular genetic. The student can calculate and evaluate a indicators of genetic variation by using various software. The student can asses a genetic distance between populations and can construct the phylogenetic tree and evaluate a phylogenetic distance
U2 - The student can prepare the genetic profiles of individuals that are intended to be berrd and identify a set optimal pairs among them. The student can measure the length of DNA fragments by using automatic capillary sequencer and software. The student can asses the results of genetic variation analysis

Social competence

K1 - The student will be able to propose a appropriate set of molecular analysis to reach the objectives of conservation programs. The student will be able to decide if conservation programs are effective or not. The student will be able to evaluate genetic similarity between populations and propose a optimal conservation strategy. The student will be able to optimize and adopt a various molecular and bioinformatics techniques to increase efficiency and decrease a costs of conservation programs

BASIC LITERATURE

1) Dieringer D., Schlötterer C. , Microsatellite analyzer (MSA): a platform independent analysis tool for large microsatellite data sets. , wyd. Molecular Ecology Notes, 2003, t. 3, s. 167-169; 2) Excoffier L., Laval G., Schneider S. , An integrated software package for population genetics data analysis, wyd. Evolutionary Bioinformatics Online, 2005, t. 1, s. 47-50; 3) Excoffier L., Smouse P., Quattro J. , Analysis of molecular variance inferred from metric distances among DNA haplotypes: Application to human mitochondrial DNA restriction data, wyd. Genetics, 1992, t. 131, s. 479-491; 4) Kaczmarczyk D., Kaczor A., New multiplex PCR assays for estimating genetic diversity in rainbow trout (Oncorhynchus mykiss) by polymorphism of microsatellite DNA, wyd. Environmental Biotechnology , 2009, t. 1, s. 19-24; 5) Schoske R., Vallone P. M., Ruitberg C. M., Butler J. M. , Multiplex PCR design strategy used for the simultaneous amplification of 10 Ychromosome short tandem repeat (STR) loci. , wyd. Analytical and Bioanalytical Chemistry, , 2003, t. 375, s. 333-343

SUPPLEMENTARY LITERATURE

1) Guo S.W., Thompson E.A. , Performing the exact test of Hardy-Weinberg proportion for multiple alleles., wyd. Biometrics, 1992, t. 48, s. 361–372; 2) Goldstein D.B., Ruiz Linares A., Cavalli-Sforza L.L, Feldman M.W. , An evaluation of genetic distances for use with microsatellite loci. , wyd. Genetics, 1993, t. 139, s. 463-471; 3) Ramaswamy, S.V., , Single Nucleotide Polymorphisms in Genes Associated with Isoniazid Resistance in Mycobacterium tuberculosisn antimicrob, wyd. Agents Chemother, 2003, t. 47, s. 1241-1250

Course / module
Informative techniques in environmental biotechnology

Fields of education:
Obszar nauk technicznych

Course status:	facultative
Course group:	C - przedmioty specjalnościowe
ECTS code:	06049-24-C
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	1 / 1

Type of course:
Lecture, Computer classes

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

Teaching forms and methods
Lecture(K1, W1, W2) : , Computer classes(U1, U2) :

Form and terms of the verification results:
LECTURE: Colloquium test - null(K1, U1, U2, W1, W2) ;COMPUTER CLASSES: Colloquium test - null(K1, U1, U2, 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 inż. Dariusz Kaczmarczyk,

Course coordinators:

Notes:
The classes should be performed in small groups

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Detailed description of the awarded ECTS points - part B

06049-24-C
ECTS:2
YEAR: 2018L

INFORMATIVE TECHNIQUES IN ENVIRONMENTAL BIOTECHNOLOGY

INFORMATIVE TECHNIQUES IN ENVIRONMENTAL BIOTECHNOLOGY

The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

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

2. Student's independent work:

-	9 h
-	9 h
	18 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 50 h : 25 h/ECTS = 2,00 ECTS
average: **2 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 1,28 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 0,72 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

MOLECULAR BIOTECHNOLOGY
MOLECULAR BIOTECHNOLOGY

06049-20-C
ECTS: 2
YEAR: 2018L

COURSE CONTENT
CLASSES:

DNA extraction from bacterial communities. Amplification of catabolic gene fragment by PCR. Detection of catabolic genes. Ribosomal Intergenic Spacer Analysis. Estimation of microbial community biodiversity using molecular approaches. Polyacryloamide gel electrophoresis. Quantification of the catabolic genes. Analysis of DNA fingerprints. Plasmid isolation from E. coli. Plasmid restriction analysis. Agarose gel electrophoresis of digested plasmids.

LECTURES:

ntroduction to molecular biotechnology and molecular biology of microorganisms. The basic tools of genetic engineering. Molecular methods (RISA, DGGE, T-RFLP) of microbial diversity analysis. Indices of biodiversity. Methods of bacterial activity measurement (mRNA and bioreporter strains). Microbial activity during bioremediation processes.

EDUCATIONAL OBJECTIVE:

The primary goal of this course is to introduce the concepts and practice of genetic engineering, with emphasis on application of molecular techniques in environmental 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_U06+, T2A_U09+, T2A_W02+, T2A_W06+,
Codes of learning outcomes in a major area of study:	K2_K03+, K2_U09+, K2_U16+, K2_W06+, K2_W10+,

LEARNING OUTCOMES:

Knowledge

W1 - Student will have knowledge concerning methods of analysis and recombination of DNA.
W2 - Student will know molecular methods useful for the study of microbial diversity and activity.

Skills

U1 - Student should acquire skills of DNA analysis, especially electrophoretic methods of DNA examination, gene fragments amplification using Polymerase Chain Reaction. Student should acquire ability to microbial diversity and genetic distance estimation on the base of DNA fingerprints.

Social competence

K1 - Student will understand the potential risk of Genetically Modified Organisms application. Student should be aware of responsibility of Genetic Modified Organisms spread in environment.

BASIC LITERATURE

1) Brown T.A, Gene Cloning and DNA Analysis: An Introduction, wyd. Blackwell Science, 2001 , s. 263pp; 2) Nicholl D.S.T., An Introduction to Genetic Engineering, wyd. Cambridge University Press, 2002 , s. 292pp; 3) Wink M., An Introduction to Molecular Biotechnology, wyd. John Wiley & Sons, 2006 , s. 2006

SUPPLEMENTARY LITERATURE

1) Glick B. R., Pasternak J. J., Patten C. L., , Molecular Biotechnology. Principles and applications of recombinant DNA, wyd. ASM Press, 2010 , s. 1000pp; 2) de Bruijn F. D., Handbook of molecular microbial ecology: Metagenomics in different habitats, wyd. Wiley Blackwell, 2011 , s. 640pp

Course / module
Molecular biotechnology

Fields of education:
Obszar nauk technicznych

Course status:	mandatory
Course group:	C - przedmioty specjalnościowe
ECTS code:	06049-20-C
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	1 / 1

Type of course:
Laboratory classes, Lecture, Computer classes

Number of hours per semester/week:	Laboratory classes: 20, Lecture: 4, Computer classes: 6

Teaching forms and methods
Laboratory classes(U1, W2) : laboratory classes, laboratory classes with the use of a computer. , Lecture(K1, W1, W2) : , Computer classes(U1) :

Form and terms of the verification results:
LABORATORY CLASSES: Report - null(U1, W1, W2) ;LECTURE: Colloquium test - test(K1, W1, W2) ;COMPUTER CLASSES: Report - preparation of a report on the exercises carried out(U1, W1, W2)

Number of ECTS points:	2
Language of instruction	angielski

Introductory courses:
molecular genetics, microbiology

Preliminary requirements:
basic knowledge of molecular genetics and microbiology

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:

Notes:
brak

ECTS code: AAABB-CD-E_F — AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Detailed description of the awarded ECTS points - part B

06049-20-C
ECTS:2
YEAR: 2018L

MOLECULAR BIOTECHNOLOGY
MOLECULAR BIOTECHNOLOGY

The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

- participation in: computer classes	6 h
- participation in: laboratory classes	20 h
- participation in: lecture	4 h
- consultation	2 h
	32 h

2. Student's independent work:

- preparation for the colloquium	6 h
- preparing a report	12 h
	18 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 50 h : 25 h/ECTS = 2,00 ECTS
average: **2 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 1,28 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 0,72 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

06049-20-A
ECTS: 4
YEAR: 2018L

ORGANIC CHEMISTRY
ORGANIC CHEMISTRY

COURSE CONTENT
CLASSES:

Persistent organic pollutants. Sources of organic pollutants, danger and analytical methods of determination of the level of contamination. Transformation process. Toxic actions of pollutants. Factors affecting xenobiotic actions. Biotransfromation – metabolism of xenobiotics. Volatile organic compounds. Pesticides and related materials. Endocrine disruption. Mutagenic pollutants. Environmental cancer.

LECTURES:

Orbitals. Hybridization. Chemical bonds. Hydrocarbons - structure and nomenclature. Aromaticity. Aromatic hydrocarbons. Alcohols, amines, carbonyl compounds. Mycotoxins. Macromolecules.

EDUCATIONAL OBJECTIVE:

The aim of the education is to familiarize with the properties of organic substances that affect the environment

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_U04+, T2A_U05+, T2A_U06++, T2A_U08+, T2A_W01+, T2A_W02++, T2A_W08+,
Codes of learning outcomes in a major area of study:	K2_K01+, K2_K03+, K2_U02+, K2_U04+, K2_U06+, K2_U16+, K2_W02+, K2_W06++, K2_W16+,

LEARNING OUTCOMES:

Knowledge

W1 - Student knows principles of organic chemistry
W2 - Student characterises main groups of environmental organic pollutants

Skills

U1 - Student should know how to correlate the structure of an organic molecule with specific biological activity
U2 - Student should be able to fit specific analytical method for quantification of a compound in environmental samples

Social competence

K1 - Student correlates the structure of an organic compound with its properties
K2 - Student correlates the structure of an organic compound with its mode of action in organisms and the probable consequences of intoxication

BASIC LITERATURE

1) McMurry S, Chemia organiczna. Rozwiązywanie problemów. , wyd. Wydawnictwo Naukowe PWN, 2005 ; 2) Łuczyński M.K., Wilamowski J., Góra M., Kozik B., Smoczyński L., Podstawy chemii organicznej: teoria i praktyka, wyd. Wydawnictwo UWM Olsztyn, 2007 ; 3) item coordinator, Materials and laboratory protocols given by a teacher. , wyd. script, 2018

SUPPLEMENTARY LITERATURE

Course / module
Organic chemistry

Fields of education:
Obszar nauk technicznych

Course status:	mandatory
Course group:	A - przedmioty podstawowe
ECTS code:	06049-20-A
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
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(U1, U2, W1, W2) : laboratory classes, seminar , Lecture(K1, K2) : information lecture

Form and terms of the verification results:
LABORATORY CLASSES: Colloquium test - test and open questions(K2, U1, U2) ;LECTURE: Written exam - test and open questions(K1, W1, W2)

Number of ECTS points:	4
Language of instruction	angielski

Introductory courses:
chermistry

Preliminary requirements:
set out the requirements, both with respect to the practical skills and to the range of knowledge

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:

Notes:
brak

Detailed description of the awarded ECTS points - part B

06049-20-A
ECTS:4
YEAR: 2018L

ORGANIC CHEMISTRY
ORGANIC CHEMISTRY

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:

-	8 h
-	9 h
-	9 h
	26 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 75 h : 25 h/ECTS = 3,00 ECTS
average: **4 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 1,96 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 2,04 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

PROFESSIONAL INTERNSHIP
PROFESSIONAL INTERNSHIP

06949-20-C
ECTS: 6
YEAR: 2018L

COURSE CONTENT
CLASSES:

Professional interships are performed in companies which scope of operation conform the chosen specialization of environmental engineering field. Based on the decision of the student, professional intership may take place in a desing ofice, municipal water and sewage service, a municipal waste management plant, environemntal protection service, an industrial plant, department of state administration and local government related to the environemntal engineering. As part of the practice students learn about the structure and organization of these parties, the principles of their financing and scope of activities. The trainee will perform the tasks assigned to the acquisition of basic skills related to the specificity of the place of practice.

LECTURES:

-

EDUCATIONAL OBJECTIVE:

The acquisition of professional knowledge and skills resulting from the chosen career path

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_W03+, T2A_W06+,
Codes of learning outcomes in a major area of study:	K2_K03+, K2_U02+, K2_W09+, K2_W10+,

LEARNING OUTCOMES:

Knowledge

W1 - Student possess the knowledge on the functioning of the company, in which the intership is carried out

Skills

U1 - Student performs tasks arising from the operation of the company in the field of environmental engineering

Social competence

K1 - Student will be able to work in teams included in the structure of the company, in which the intership is carried out

BASIC LITERATURE

1) Mark Oldman, Samer Hamadeh, The Intership Bible, wyd. Princeton Review., 2005

SUPPLEMENTARY LITERATURE

Course / module
Professional internship

Fields of education:
Obszar nauk technicznych

Course status:	facultative
Course group:	C - przedmioty specjalnościowe
ECTS code:	06949-20-C
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	1 / 1

Type of course:
Practical training

Number of hours per semester/week: Practical training: 160

Teaching forms and methods

Form and terms of the verification results:
PRACTICAL TRAINING: Write-up - The final report based on the daybook of the practitioner, experience gained, reports made during the intership, any oral exams.(K1, U1, W1)

Number of ECTS points:	6
Language of instruction	polski

Introductory courses:
-

Preliminary requirements:
Students should posses basic knowledge in the field of environmental engineering before the start of the intership

Name of the organizational unit offering the course:
Katedra Biotechnologii w Ochronie Środowiska,

Person in charge of the course:
dr inż. Sławomir Kasiński,

Course coordinators:

Notes:

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Detailed description of the awarded ECTS points - part B

06949-20-C
ECTS:6
YEAR: 2018L

PROFESSIONAL INTERNSHIP
PROFESSIONAL INTERNSHIP

The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

- consultation	2 h
	2 h

2. Student's independent work:

- participation in the intership	160 h
- preparation of the final report	2 h
	162 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 164 h : 27 h/ECTS = 6,07 ECTS
average: **6 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 0,07 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 5,93 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

06049-20-C
ECTS: 3
YEAR: 2018L

TECHNICAL BIOCENOSES
TECHNICAL BIOCENOSES

COURSE CONTENT
CLASSES:

Presentation of the biomass cultivation technologies in wastewater treatment systems including activated sludge, biofilm and aerobic granular sludge. Enzymatic activity of the biomass. The role of extracellular polymers in formation of complex microbial structures. Evaluation of the effectiveness of nitrogen conversions by activated sludge depending on the operational parameters of wastewater treatment. Nitrogen balance in wastewater treatment systems. Evaluation of the abundance and diversity of nitrogen-converting microorganisms using molecular biology methods, depending on the operational parameters of wastewater treatment. Theoretical bases of high-throughput sequencing.

LECTURES:

Relation between the operational parameters of wastewater treatment and microbial structure and activity of biomass. Presentation of the biomass cultivation technologies in wastewater treatment systems: activated sludge, biofilm, aerobic granular sludge. The role of extracellular polymers (EPS) in formation of complex microbial structures. Microorganisms of methane fermentation. Bioaugmentation. Microbial succesion during composting. The application of molecular techniques to the study of complex microbial consortia in technical systems.

EDUCATIONAL OBJECTIVE:

Recognizing the types of technical biocenoses in wastewater treatment and mechanisms of their formation. Understanding the relationship between the species composition of biomass and the efficiency of the wastewater treatment process.

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_U17+, T2A_U19+, T2A_W03+, T2A_W08+,
Codes of learning outcomes in a major area of study:	K2_K01+, K2_K02+, K2_K03+, K2_U02+, K2_U03+, K2_U04+, K2_U07+, K2_U14+, K2_U16+, K2_W09+, K2_W16+,

LEARNING OUTCOMES:

Knowledge

W1 - Defines the types of biomass in wastewater treatment sysmes and recognizes the relationships between technological parameters of wastewater treatment and the structure of microbial consortia in activated sludge. Understands the role of bioaugmentation for the improvement of biotechnological processess. Characterizes groups of nitrogen-converting microorganisms in wastewater treatment systems. Lists the molecular biology techniques used to evaluate the abundance and diversity of microorganisms in wastewater treatment systems, including emerging technologies
W2 - Characterizes the composition of extracellular polymers and defines their role in the formation of complex microbial structures. Understands the role of extracellular enzymes in biological tretament

Skills

U1 - Calculates the nitrogen balance in wastewater treatment systems. Knows how to interpret the relationships between the molecular and technological results. Can write a report from the conducted experiments
U2 - Knows how to characterize biomass in wastewater treatment systems. Knows how to apply techniques of molecular biology in order to obtain information about the microorganisms that inhabit wastewater treatment systems
U3 - Determines the operational parameters and effectiveness of wastewater treatment by activated sludge method, depending on the composition of wastewater

Social competence

K1 - 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 learning throughout life

BASIC LITERATURE

1) Wojnowska-Baryła I., Cydzik-Kwiatkowska A., Zielińska M., The application of molecular techniques to the study of wastewater treatment systems, Methods in molecular biology , wyd. Clifton, N.J., 2010 , s. 599, 157-1; 2) Cydzik-Kwiatkowska A. , Materials and laboratory protocols given by a teacher, wyd. UWM Olsztyn, 2016 ; 3) Spiro T.G.,Stigliani W.M., Chemistry of the Environment, 2nd Edition, wyd. Prentice Hall, 2002 ; 4) Snyder L.,Champness W., Molecular Genetics of Bacteria, wyd. ASM Press, 2007 , s. 735

SUPPLEMENTARY LITERATURE

1) , Scientific publications in the field

Course / module
Technical biocenoses

Fields of education:
Obszar nauk technicznych

Course status:	mandatory
Course group:	C - przedmioty specjalnościowe
ECTS code:	06049-20-C
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	1 / 1

Type of course:
Laboratory classes, Lecture, Computer classes

Number of hours per semester/week:	Laboratory classes: 30, Lecture: 10, Computer classes: 5

Teaching forms and methods
Laboratory classes(K1, K2, U1, U2, U3, W1, W2) : laboratory classes and course classes , Lecture(K1, U2, W1, W2) : information lecture, Computer classes(K2, U3) : laboratory classes with the use of a computer

Form and terms of the verification results:
LABORATORY CLASSES: Write-up - grades from the laboratory reports(K1, K2, U1, U2, U3, W1, W2) ;LECTURE: Colloquium test - grade from a final test (K1, U2, W1, W2) ;COMPUTER CLASSES: Write-up - grades from the reports(K1, K2, U1, U2, U3, W1, W2)

Number of ECTS points:	3
Language of instruction	polski

Introductory courses:
biology, mathematics

Preliminary requirements:
basic knowledge on microbial bases of wastewater treatment

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:

Notes:
up to 18 students

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Detailed description of the awarded ECTS points - part B

06049-20-C
ECTS:3
YEAR: 2018L

TECHNICAL BIOCENOSES
TECHNICAL BIOCENOSES

The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

- participation in: computer classes	5 h
- participation in: laboratory classes	30 h
- participation in: lecture	10 h
- consultation	2 h
	47 h

2. Student's independent work:

- prepration for the laboratory classess, preparation of laboratory reports, preparation for the final test	28 h
	28 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 75 h : 25 h/ECTS = 3,00 ECTS
average: **3 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 1,88 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 1,12 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

06049-20-C
ECTS: 4
YEAR: 2018L

TOXIC CHEMICAL RISK
TOXIC CHEMICAL RISK

COURSE CONTENT
CLASSES:

ealth and Safety regulations, organizational issues, introduction to the subject. User manual of the molecular biology equipment. Pippetting micro volumes of liquids with different physical properties (density, viscosity). Lethal toxicity tests on fish. Calculation of median lethal concentration (LC50), median lethal time (LT50) values, and toxic units number. Phytotoxicity assessment using PHYTOTOX kit for tests on monocotyledonous (sorghum) and cotyledonous plants (cress, mustard). Physiological endpoints of toxicity: examination of blood smears and liver sections of fish exposed to polycyclic aromatic hydrocarbons (PAHs) using light microscopy (laboratory classess). Molecular toxicology: analysis of gene expression after exposure to model toxic substance. Genotoxicology: assessment of genotoxic effect of PAHs on fish's erythrocytes and hepatocytes using the comet assay. Risk assessment: hazard identification, analysis of exposure, analysis of effects, rick characterization. Ecological risk assessment.

LECTURES:

Toxic chemical risk as science. Environmental pathways of toxic chemicals. Dose effect. Toxicity testing in animals. Studies of human populations at risk. The body's defenses against chemical toxicity. Mechanisms of chemical disease. Human health risk assessment. Ecological risk assessment. Managing chemical risk

EDUCATIONAL OBJECTIVE:

To make students familiar with the science that underlies toxic chemical risk analysis, the physiological and molecular basis of chemical toxicity, the process of assessing toxic chemical risk to human health and environment, and the strategies employed in managing it

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_K05+, T2A_K07+, T2A_U08+, T2A_W01+,
Codes of learning outcomes in a major area of study:	K2_K02+, K2_U06+, 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 attitute 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) Logan, J., Edwards, K., Saunders, N.,, Real Time PCR: Current technology and applications. , wyd. Academic Press, 2009 ; 2) Vanden Heuvel, J.P., , Protocols in Molecular Toxicology, wyd. CRC Press, 1998 ; 3) Brown, T.A. , Molecular Biology Labfax. BIOS Scientific Publishers, wyd. Oxford,UK, 1991 ; 4) Fisher J., Arnold, J.R.P., Chemistry for Biologists. Instant Notes Series. , wyd. Bios Scientific Publishers, Oxford, 2000

SUPPLEMENTARY LITERATURE

Course / module
Toxic chemical risk

Fields of education:
Obszar nauk technicznych

Course status:	mandatory
Course group:	C - przedmioty specjalnościowe
ECTS code:	06049-20-C
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	1 / 1

Type of course:
Laboratory classes, Lecture, Computer classes

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

Teaching forms and methods

Laboratory classes(K1, U1) : laboratory classes (condunting experiment)., Lecture(W1) : information lecture (multimedia presentation, problem lecture, conversation)., Computer classes(K1, U1) : laboratory classes with the use of a computer (designing experiment, statistical analysis),

Form and terms of the verification results:

LABORATORY CLASSES: Report - grade for laboratory report (K1, U1) ;LECTURE: Written exam - test(W1) ;COMPUTER CLASSES: Colloquium practical - statistical analysis on the computer(K1, U1)

Number of ECTS points:	4
Language of instruction	angielski

Introductory courses:
biology, chemistry

Preliminary requirements:
basic knowledge of molecular genetics, good pippetting skills

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:

Notes:
brak

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Detailed description of the awarded ECTS points - part B

06049-20-C
ECTS:4
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: computer classes	15 h
- participation in: laboratory classes	30 h
- participation in: lecture	15 h
- consultation	4 h
	64 h

2. Student's independent work:

- exam preparation	15 h
- preparing a report	6 h
- preparing to pass exercises	15 h
	36 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 100 h : 25 h/ECTS = 4,00 ECTS
average: **4 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 2,56 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 1,44 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

06049-24-C
ECTS: 2
YEAR: 2018L

WRITING SCIENTIFIC PAPERS
WRITING SCIENTIFIC PAPERS

COURSE CONTENT
CLASSES:

1. Variety of publications, 2. Planning, 3. Organising the paper, 4. Dealing with copyright, 5. Outlining the paper, 6. Writing the first draft, 7. Writing the Abstract and Introduction, 8. Writing the Results section, 9. How to write the Discussions, 10. Impact Factor (IF) and Hirsch Index (HI) (h-index), 11. Diagrams, 12. Photomicrographs, 13. Charts and tables, 14. Slides, 15. Posters

LECTURES:

How to read, write, present and publish scientific papers

EDUCATIONAL OBJECTIVE:

HOW TO WRITE SCIENCE WORKS

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_U03++, T2A_U04++, T2A_U06++, T2A_W01+, T2A_W05+, T2A_W10+,
Codes of learning outcomes in a major area of study:	K2_K01+, K2_K03+, K2_U04++, K2_W01+, 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) Łuczyński M., Writing Scientific Papers. Materials for internal use at the Department of Environmental Biotechnology., wyd. Skrypt autorski, 2016

SUPPLEMENTARY LITERATURE

Course / module
Writing scientific papers

Fields of education:
Obszar nauk technicznych

Course status:	facultative
Course group:	C - przedmioty specjalnościowe
ECTS code:	06049-24-C
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia/ masters
Year/Semester:	1 / 1

Type of course:
Lecture, Auditorium classes

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

Teaching forms and methods
Lecture(W1, W2) : Lecture information lecture , Auditorium classes(K1, K2, U1, U2) : classes: panel discussion

Form and terms of the verification results:
LECTURE: Colloquium test - test(K1, K2, U1, U2, W1, W2) ;AUDITORIUM CLASSES: Colloquium test - test(K1, K2, U1, U2, W1, W2)

Number of ECTS points:	2
Language of instruction	polski

Introductory courses:
none

Preliminary requirements:
none

Name of the organizational unit offering the course:

Person in charge of the course:

Course coordinators:
dr hab. inż. Agnieszka Cydzik-Kwiatkowska,

Notes:
brak

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Detailed description of the awarded ECTS points - part B

06049-24-C
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	15 h
- participation in: lecture	15 h
- consultation	2 h
	32 h

2. Student's independent work:

- preparation for completing the course	18 h
	18 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 50 h : 25 h/ECTS = 2,00 ECTS
average: **2 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 1,28 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 0,72 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

06049-20-C
ECTS: 3
YEAR: 2019Z

ALGAE BIOMASS - SOURCES AND METHODS OF APPLICATION
ALGAE BIOMASS - SOURCES AND METHODS OF APPLICATION

COURSE CONTENT
CLASSES:

The calculation of the efficiency of the chosen methods of obtaining biomass from natural sources. The calculation of the efficiency of the algae biomas production in open systems. The calculation of the efficiency of the algae biomas production in foto-bioreactors. The calculation of the biogas production using algal biomass. The calculation of oli production using algal biomass. The calculation of protein production using algal biomass.

LECTURES:

Charisteria of algae biomass. Natural source of algae biomass. Methods of algae biomass cultivation. Algae as a source of biomass for the methane fermentation process. Algae as a source of liquid fuels. Burning and pyrolysis of algae biomass. Algae as a source of proteins.

EDUCATIONAL OBJECTIVE:

The aim of education is to familiarize with the following topics; Characteristics of algae biomass. Natural source of algae biomass. Methods of algae biomass cultivation. Algae as a source of biomass for the methane fermentation process. Algae as a source of liquid fuels. Burning and pyrolysis of algae biomass. Algae as a source of proteins.

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_U04+, T2A_U08+, T2A_W01+, T2A_W02+,
Codes of learning outcomes in a major area of study:	K2_K01+, K2_K03+, K2_U04+, K2_U06+, K2_W02+, K2_W06+,

LEARNING OUTCOMES:

Knowledge

W1 - Student lists sources of algae biomass.
W2 - Student knows methods of algae biomass using. Student knows potential of algae biomass

Skills

U1 - Students can calculate potential of biomass production in different systemss.
U2 - Students can calculate potential of acquisition algae from natural sources. Students can calculate energy production from algae biomass in different process (biogass, oli, burning

Social competence

K1 - The student is aware of the need for self-education. The student understands the rules for the use of natural resources

BASIC LITERATURE

1) DĘBOWSKI M., ZIELIŃSKI M., GRALA A., DUDEK M., , Algae biomass as an alternative substrate in biogas production technologies – review,, wyd. Renewable and Sustainable Energy Reviews 27, 2013 , s. 596-604; 2) Bux Faizal , Algae Biotechnology, wyd. Springer International Publishing AG, 2015

SUPPLEMENTARY LITERATURE

1) Ashok Pandey, Duu-Jong Lee, Yusuf Chisti and Carlos R Soccol , Biofuels from Algae , wyd. Elsevier B.V, 2014 ; 2) Carl J. Soeder , Gedaliah Shelef , Algae Biomass: Production and Use, wyd. Elsevier Science Ltd, 1980

Course / module
Algae biomass - sources and methods of application

Fields of education:
Obszar nauk technicznych

Course status:	facultative
Course group:	C - przedmioty specjalnościowe
ECTS code:	06049-20-C
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	2 / 3

Type of course:
Lecture, Project classes

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

Teaching forms and methods
Lecture(K1, W1, W2) : lectures: information lecture , Project classes(U1, U2) : project classes

Form and terms of the verification results:
LECTURE: Exam - null(K1, W1, W2) ;PROJECT CLASSES: Colloquium test - null(U1, U2)

Number of ECTS points:	3
Language of instruction	polski

Introductory courses:
-

Preliminary requirements:
: basics knowlegde from renewable energy

Name of the organizational unit offering the course:
Katedra Inżynierii Środowiska,

Person in charge of the course:
dr hab. inż. Marcin Dębowski, prof. UWM

Course coordinators:

Notes:
-

ECTS code: AAABB-CD-E_F

AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Detailed description of the awarded ECTS points - part B

06049-20-C
ECTS:3
YEAR: 2019Z

ALGAE BIOMASS - SOURCES AND METHODS OF APPLICATION

ALGAE BIOMASS - SOURCES AND METHODS OF APPLICATION

The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

- participation in: project classes	30 h
- participation in: lecture	15 h
- consultation	2 h
	47 h

2. Student's independent work:

- preparing for classes	18 h
- preparing for tests	5 h
- preparing to exam	5 h
	28 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 75 h : 25 h/ECTS = 3,00 ECTS

average: **3 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 1,88 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 1,12 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

01049-24-C
ECTS: 3
YEAR: 2019Z

BIOCATALYSIS AND BIOTRANSFORMATION IN ENVIRONMENTAL BIOTECHNOLOGY
BIOKATALYSIS AND BIOTRANSFORMATION IN ENVIRONMENTAL 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_U03+, T2A_U04+, T2A_U06++, T2A_U11+++, T2A_U16+, T2A_U18+, T2A_W07+++,
Codes of learning outcomes in a major area of study:	K2_K01++, K2_K03+++, K2_U04+, K2_U15+++, K2_U16++, K2_W12+++,

LEARNING OUTCOMES:

Knowledge

W1 - List the principal types of reaction that can be catalysed by enzymes and/or whole cell systems on the industrial scale
W2 - Show what the advantages are over traditional homogeneous and heterogeneous catalysis and also what the problems/limitations are
W3 - Have knowledge of the cofactors needed by isolated enzymes and how (and why) they are recycled
W4 - Describe the chemical mechanisms catalysed by the main types of enzyme used in industry
W5 - Describe the basic types of reactor used in industry for biocatalytic processes
W6 - Describe basic enzyme kinetics in terms of the Michaelis-Menten equation and understand the problem of product inhibition

Skills

U1 - Apply chemical mechanisms in normal organic reactions to those used by enzymes.
U2 - Critically evaluate the pros and cons of using traditional organic chemistry versus biocatalysis for a large scale process
U3 - Understand that physical behaviour, reaction medium composition is crucial in enzymatic systems

Social competence

K1 - Recognise possibilities for the use of enzymes (or whole cell biocatalysts) in environmental biotechnology
K2 - Recognise the potential benefits of biocatalysis in terms of economy of reaction steps, mild conditions and generally clean processes
K3 - Understand Michaelis-Menten Kinetics and its implications for enzyme use in biotechnology
K4 - Critically analyse synthetic routes and identify wasteful and/or inefficient steps
K5 - Describe industrial reactor types suitable for a specific reaction
K6 - Descibe methods of enzyme and whole-cell catalysts utilization

BASIC LITERATURE

1) Cao L., Carrier-bound immobilized enzymes, wyd. Wiley-VCH, 2005 ; 2) Bornschuer U.T., Kazlauskas R.J., Hydrolases in organic synthesis, wyd. Wiley-VCH, 2006 ; 3) Buchholz K., Kasche V., Bornscheuer U.T., Biocatalysts and enzyme technology, wyd. Wiley-VCH, 2005 ; 4) Grunwald P., Biocatalysis. Biochemical fundamentals and applications, wyd. Imperial College Press, 2009 ; 5) Bommarius A.S., Riebel B.R., Biocatalysis. Fundamentals and applications, wyd. Wiley-VCH, 2004 ; 6) Reymond J.-L., Enzyme assays, wyd. Wiley-VCH, 2006 ; 7) Hou C.T., Handbook of industrial biocatalysis, wyd. CRC, 2005

SUPPLEMENTARY LITERATURE

1) Marangoni A,.G., Enzyme kinetics, A modern approach, wyd. Wiley, 2003 ; 2) Aggelis G., Microbial conversions of raw glycerol, wyd. Nova, 2009 ; 3) Bisswanger H., Practical enzymology, wyd. Wiley-VCH, 2006 ; 4) Brakmann S., Schwienhorst A, Evolutionary methods in biotechnology, wyd. Wiley-VCH, 2004 ; 5) Brakmann S., Johnsson K., Directed molecular evolution of proteins, wyd. Wiley-VCH, 2002

Course / module
Biocatalysis and biotransformation in environmental biotechnology

Fields of education:
Obszar nauk technicznych

Course status:	mandatory
Course group:	C - przedmioty specjalnościowe
ECTS code:	01049-24-C
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	1 / 2

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, K3, K4, K5, K6, U1, U2, U3) : , Lecture(W1, W2, W3, W4, W5, W6) :

Form and terms of the verification results:
LABORATORY CLASSES: Write-up - null(K1, K2, K3, K4, K5, K6, U1, U2, U3) ;LABORATORY CLASSES: Written test - null(W1, W2, W3, W4, W5, W6) ;LABORATORY CLASSES: Evaluation of the work and cooperation in the group - null(K1, K2, K3, K4, K5, K6) ;LECTURE: Written test - null(W1, W2, W3, W4, W5, W6)

Number of ECTS points:	3
Language of instruction	polski

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:

Notes:

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Detailed description of the awarded ECTS points - part B

01049-24-C
ECTS:3
YEAR: 2019Z

BIOCATALYSIS AND BIOTRANSFORMATION IN ENVIRONMENTAL BIOTECHNOLOGY

BIOKATALYSIS AND BIOTRANSFORMATION IN ENVIRONMENTAL BIOTECHNOLOGY

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	2 h
	47 h

2. Student's independent work:

-	6 h
-	18 h
-	4 h
	28 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 75 h : 25 h/ECTS = 3,00 ECTS
average: **3 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 1,88 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 1,12 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

06049-20-C
ECTS: 3
YEAR: 2019Z

BIOMARKERS OF ENVIRONMENTAL CONTAMINATION
BIOMARKERS OF ENVIRONMENTAL CONTAMINATION

COURSE CONTENT
CLASSES:

Presentation of Health and Safety regulations. Good laboratory practice. Training pippetting micro volumes of liquids with different physical properties, i.e. density, viscosity. Preparation of the short-term waterborne exposure of zebrafish (Danio rerio) embryos to a suit of model toxic compounds. Evaluation of anatomical malformations and physiological abnormalities in the exposed zebrafish larvae. Isolation of total RNA using modified Chomczynski method. Spectrophotometric measurement of quantity and purity of the isolated RNA samples. Elimination of genomic DNA from the samples.Assessment of RNA integrity. Reverse transcription. Analysis of gene expression using real-time quantitative PCR (qPCR). Calculations of raw values obtained from qPCR and their statistical analysis. Seminar on the molecular mechanisms of action of selected groups of environmental contaminant. Presentation of the laboratory results. Genotoxicity assessment of the selected model compounds. Analysis of microscope slides images obtained by micronucleus test and comet assay.

LECTURES:

Definition and classification of biomarkers. Specificity of biomarkers. Relationship between effect and biomarker's response. Plant's response to environmental stress. Behavioral changes of animals. Anatomical and physiological endpoints of environmental pollutants. Mutagenicity, genotoxicity, and cancerogenicity of environmental contaminants. Polycyclic aromatic hydrocarbons. Toxic metals metabolism. Oxidative stress. Endocrine Discrupting Compounds. Environmental estrogens and androgens, and their molecular mechanisms of action. Pharmaceuticals and their residues in aquatic environment. Nanoparticles – threat or chance? Biomarkers at the molecular level. Micro RNAs as an emerging tool in prognostic studies. The role of biomarkers in environmental risk assessment. The use of biomarkers in environmental monitoring.

EDUCATIONAL OBJECTIVE:

The student gains knowledge about biomarkers of environmental contamination

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_U03+, T2A_U04+, T2A_U06+, T2A_U08+, T2A_W01+, T2A_W02+,
Codes of learning outcomes in a major area of study:	K2_K01+, K2_K03+, K2_U04+, K2_U06+, K2_W02+, K2_W06+,

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) 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. Bios Scientific Publishers, wyd. Oxford, 2000

SUPPLEMENTARY LITERATURE

Course / module
Biomarkers of environmental contamination

Fields of education:
Obszar nauk technicznych

Course status:	facultative
Course group:	C - przedmioty specjalnościowe
ECTS code:	06049-20-C
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	2 / 3

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) : condunting experiment, Lecture(W1, W2) : information lecture (multimedia presentation, problem lecture, conversation)

Form and terms of the verification results:
LABORATORY CLASSES: Report - grade for laboratory report with presentation (K1, K2, U1, W1, W2) ;LECTURE: Colloquium test - test(W1, W2)

Number of ECTS points:	3
Language of instruction	angielski

Introductory courses:
biology, chemistry, toxic chemical risk

Preliminary requirements:
basic knowledge of molecular genetics, good pippetting skills

Name of the organizational unit offering the course:
Katedra Biotechnologii w Ochronie Środowiska,

Person in charge of the course:
dr inż. Maciej Woźny,

Course coordinators:

Notes:
Laboratory classes conducted for small groups (max. 12 students)

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Detailed description of the awarded ECTS points - part B

06049-20-C
ECTS:3
YEAR: 2019Z

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

2. Student's independent work:

- preparation for laboratory classes	15 h
- prepare to complete the course	10 h
- preparing a presentation	5 h
- preparing a report	13 h
	43 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 90 h : 25 h/ECTS = 3,60 ECTS

average: **3 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 1,88 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 1,12 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

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Course / module syllabus - part A

13049-20-C
ECTS: 3
YEAR: 2019Z

BIOREMEDIATION
BIOREMEDIATION

COURSE CONTENT
CLASSES:

Design of bioremediation for soils contaminated with petroleum and heavy metals. Laboratory project of soil bioremediation with natural, organic amendments. Laboratory project of soil bioremediation using natural washing agents. Presentation of the project results.

LECTURES:

Introduction to bioremediation. Definitions of bioremediation. Fundamentals of microbial remediation techniques. Type of microorganisms for bioremediation. Microbial degradation of selected contaminants in soil and groundwater. Factors influencing the microbial degradation of contaminants. Design and monitoring of bioremediaton. Advantages and disadvantages of bioremediation. Classification and characterization of bioremediation methods. Application of natural amendments in soil bioremediation. Phytoremediation for treatment of soils contaminated with organic and inorganic pollutants.

EDUCATIONAL OBJECTIVE:

Extention of knowledge in terms of bioremediation methods used for environment treatment

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_U10+, T2A_U17+, T2A_U19+, T2A_W03+, T2A_W07+,
Codes of learning outcomes in a major area of study:	K2_K01+, K2_K02+, K2_K03+, K2_U02+, K2_U03+, K2_U04+, K2_U06+, K2_U13+, K2_U14+, K2_U16+, K2_W09+, K2_W12+,

LEARNING OUTCOMES:

Knowledge

W1 - Students will have knowledge of bioremediation methods
W2 - Students know factors affecting their efficiency; microbial transformations of hazardous chemicals; the manners of modification of pollutant mobility in soil environment, usability of different plant species to detoxify polluted soils

Skills

U1 - Students will gain experience in designing of selected bioremediation process and in evaluation of their efficiency
U2 - Students will be able to perform bioremediation experiments in laboratory scale and to control the process run
U3 - Students will be able to interpret the obtained results, discuss them with literature data and draw appropriate conclusions

Social competence

K1 - Students will be aware of the importance of bioremediation methods in protection and restoration of the environment. Students will recognize the need to care for the environment
K2 - Students will gain experience of working in a team and of determining priorities for achiving the objectives

BASIC LITERATURE

1) International Centre for Soil and Contaminated Sites, Manual for biological remediation techniques, wyd. author's script, 2006 ; 2) Singh A., Ward O.P. , Applied Bioremediation and Phytoremediation, wyd. Springer, 2004 ; 3) Yong R.N., Mulligan C.N. , Natural attenuation of contaminants in soils, wyd. Lewis Publishers, 2004 ; 4) Crawford R.L.,Crawford D.L. , Bioremediation – principles and applications, wyd. Cambridge University Press, 1996 ; 5) Pacwa-Płociniczak M., Płaza G.A., Piotrowska-Seget Z., Cameotra S.S. , Environmental applications of biosurfactants: recent advances, wyd. International Journal of Molecular Sciences , 2011, t. 12, s. 633-654

SUPPLEMENTARY LITERATURE

1) Singh A., Kuhad R.C., Ward O.P. , Advances in Applied Bioremediation, wyd. Springer, 2009 ; 2) Talley J.W. , Bioremediation of recalcitrant compounds, wyd. CRC Taylor & Francis, 2005 ; 3) Bolan N., Kunhikrishnan A., Thangarajan R., (...), Kirkham M.B., Scheckel K. , Remediation of heavy metal(loid)s contaminated soils - To mobilize or to immobilize?, wyd. Journal of Hazardous Materials , 2014, t. 266, s. 141-166

Course / module
Bioremediation

Fields of education:
Obszar nauk technicznych

Course status:	mandatory
Course group:	C - przedmioty specjalnościowe
ECTS code:	13049-20-C
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	1 / 2

Type of course:
Laboratory classes, Lecture

Number of hours per semester/week:	Laboratory classes: 35, Lecture: 10

Teaching forms and methods
Laboratory classes(K1, K2, U1, U2, U3) : laboratory classes and classes with the use of a computer and projector, Lecture(K1, W1, W2) : information lecture

Form and terms of the verification results:
LABORATORY CLASSES: Report - reports from laboratory projects(K2, U1, U2) ;LABORATORY CLASSES: Prezentation - Presentation on the results obtained from laboratory projects and bioremediation methods(K1, U3, W1, W2) ;LECTURE: Written exam - open and closed questions(K1, W1, W2)

Number of ECTS points:	3
Language of instruction	angielski

Introductory courses:
chemistry, biochemistry, microbiology

Preliminary requirements:
basic knowledge of chemistry, biochemistry and microbiolog

Name of the organizational unit offering the course:
Katedra Biotechnologii w Ochronie Środowiska,

Person in charge of the course:
dr hab. inż. Zygmunt Gusiatin,

Course coordinators:

Notes:
Laboratory projects performed in 2-3 person teams.

ECTS code: AAABB-CD-E_F

AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Detailed description of the awarded ECTS points - part B

13049-20-C
ECTS:3
YEAR: 2019Z

BIOREMEDIATION
BIOREMEDIATION

The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

- participation in: laboratory classes	35 h
- participation in: lecture	10 h
- consultation	4 h
	49 h

2. Student's independent work:

- preparation for exam	16 h
- preparation for laboratory projects	6 h
- preparation for presentation	8 h
- preparation of reports from laboratory projects	8 h
	38 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 87 h : 25 h/ECTS = 3,48 ECTS
average: **3 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 1,96 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 1,04 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

06049-20-C
ECTS: 3
YEAR: 2019Z

BIOTECHNOLOGY OF SOLID WASTE
BIOTECHNOLOGY 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_U03++, T2A_U04++, T2A_U06+++, T2A_U10++, T2A_U14+, T2A_U17+, T2A_U19+, T2A_W04+, T2A_W07+,
Codes of learning outcomes in a major area of study:	K2_K01+, K2_K02+, K2_K03+, K2_U04++, K2_U10+, K2_U14+, K2_U16+, K2_W11+, K2_W12+,

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 - K01 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:	mandatory
Course group:	C - przedmioty specjalnościowe
ECTS code:	06049-20-C
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	1 / 2

Type of course:
Lecture, Auditorium classes

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

Teaching forms and methods
Lecture(K1, K2, W1, W2) : , Auditorium classes(K1, K2, U1, U2, U3) :

Form and terms of the verification results:
LECTURE: Colloquium test - null(K1, K2, U1, U2, U3, W1, W2) ;AUDITORIUM CLASSES: Project - null(K1, K2, U1, U2, U3) ;AUDITORIUM CLASSES: Colloquium test - null(K1, K2, U1, U2, U3, W1, W2)

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. Katarzyna Bernat,

Course coordinators:

Notes:

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Detailed description of the awarded ECTS points - part B

06049-20-C
ECTS:3
YEAR: 2019Z

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: auditorium classes	30 h
- participation in: lecture	15 h
- consultation	2 h
	47 h

2. Student's independent work:

-	8 h
-	14 h
-	15 h
-	6 h
	43 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 90 h : 25 h/ECTS = 3,60 ECTS
average: **3 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 1,88 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 1,12 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

06049-20-C
ECTS: 3
YEAR: 2019Z

DESIGNING BIOWASTE TREATMENT PROCESSES
DESIGNING BIOWASTE TREATMENT PROCESSES

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_K02+, T2A_K03+, T2A_K04+, T2A_K06+, T2A_U09+, T2A_W01+,
Codes of learning outcomes in a major area of study:	K2_K01+, K2_U09+, K2_W01+,

LEARNING OUTCOMES:

Knowledge

W1 - At the end of the course, Students should have knowledge on optimization of the process of biological treatment of biodegradable waste, including parameters such as availability of nutrients, moisture, temperature, aeration intensity in aerobic processes, as well as the knowledge on the modeling of the conditions occurring in an energetic pile. Students should know the basics of the software tools for designing processes

Skills

U1 - Students, while attending classes, should acquire skills to develop technological processes of biological treatment of municpal solid waste, sewage sludge under aerobic and anaerobic conditions. They should also be able to use advanced programming tools to develop a three-dimensional model of a reactor for biological treatment of waste

Social competence

K1 - The program has been prepared to provide students competencies to work in the waste biotreatment industry, such as composting plants, landfills, waste bio-drying plants, sewage treatment plants. Students have to possess basic knowledge for the effective and safe operation of the energetic pile, the management of the biological processes yielding biogas and production of high quality compost

BASIC LITERATURE

1) Evans G.,, Biowaste and Biological Waste Treatment, wyd. Earthscan, 2001 ; 2) Hansen J. A.,, Management of Urban Biodegradable Wastes: Collection, Occupational Health, Biological Treatment, Product Quality Criteria and End User Demand., wyd. Eartscan. , 1996 ; 3) Mata Alvarez J., , Biomethanization of the Organic Fraction of Municipal Solid Wastes., wyd. IWA Publishing, 2003 ; 4) Jördening, H.-J., Winter J., , Environmental Biotechnology: Concepts and Applications., wyd. John Wiley & Sons, 2005 ; 5) Nayono S. E., , Anaerobic Digestion of Organic Solid Waste for Energy Production, wyd. KIT Scientific Publishing, 2009

SUPPLEMENTARY LITERATURE

Course / module
Designing biowaste treatment processes

Fields of education:
Obszar nauk technicznych

Course status:	facultative
Course group:	C - przedmioty specjalnościowe
ECTS code:	06049-20-C
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	2 / 3

Type of course:
Lecture, Project classes

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

Teaching forms and methods
Lecture(K1, W1) : , Project classes(U1) :

Form and terms of the verification results:
LECTURE: Colloquium test - null(K1, W1) ;PROJECT CLASSES: Written test - null(U1)

Number of ECTS points:	3
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 inż. Sławomir Kasiński,

Course coordinators:

Notes:
Required to have a calculator by every student and a laptop (if possible) by every second student

Detailed description of the awarded ECTS points - part B

06049-20-C
ECTS:3
YEAR: 2019Z

DESIGNING BIOWASTE TREATMENT PROCESSES
DESIGNING BIOWASTE TREATMENT PROCESSES

The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

- participation in: project classes	30 h
- participation in: lecture	15 h
- consultation	2 h
	47 h

2. Student's independent work:

-	10 h
-	8 h
-	10 h
	28 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 75 h : 25 h/ECTS = 3,00 ECTS
average: **3 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 1,88 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 1,12 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

06949-20-C
ECTS: 3
YEAR: 2019Z

DESIGNING OF AGRICULTURE BIOGAS PLANTS
DESIGNING OF AGRICULTURE BIOGAS PLANTS

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_K07+, T2A_U19+, T2A_W07+,
Codes of learning outcomes in a major area of study:	K2_K02+, K2_U15+, K2_W12+,

LEARNING OUTCOMES:

Knowledge

W1 - A student will have knowledge of biochemical fundaments of anaerobic digestion. He will decribe parameters which influence on the efficiency of a biogas production. They will describe methods of heating and mixing of a digester chamber. He will have knowledge of manners of digestate post-treatment. He will describe methods of biogas cleaning and utilization.

Skills

U1 - Students will be able to estimate a biogas yield for substrates and co-substrates. They will be able to determine a substrate requirement for a biogas plant with defined rating. They will be able to calculate operational parameters for a digestion chmber. They will be able to prepare a technological concept of an agricultural biogas plant with a different electric power.

Social competence

K1 - A student will understand the importance of a devoplment of methods of a biogas production from waste and by-products.

BASIC LITERATURE

1) Deublein D., Steinhauser A. , Biogas from Waste and Renewable Resources, wyd. Wiley-VCH verlag GmgH & Co. KGaA, Weinheim, 2011 ; 2) Wellinger A., Murphy J., Baxter D. (Eds.), The Biogas Handbook: Science, Production And Applications. 1st Ed., wyd. Woodhead Publishing, 2013 ; 3) Abbasi T., Tauseef S.M., Abbasi S.A., Biogas Energy. , wyd. Springer, 2011 ; 4) Mudhoo A. (Ed.), Biogas Production: Pretreatment Methods in Anaerobic Digestion. 1 st Ed. , wyd. Wiley-Scrivener, 2012

SUPPLEMENTARY LITERATURE

1) Chen Y., Cheng J.J., Creamer K.S., Inhibition of anaerobic digestion process: A review. Bioresource Technol., wyd. Bioresource Technology, 2008, t. 99(10), s. 4044-4064; 2) Kayhanian M., Tchobanoglous G. , Energy Recovery by Anaerobic Digestion. In: Kreith F., Goswami D.Y. (Edts.), Handbook of Energy Efficiency and Renewable Energy. , wyd. CRC Press Taylor & Francis Group, Boca Raton, USA., 2007

Course / module
Designing of agriculture biogas plants

Fields of education:
Obszar nauk technicznych

Course status:	facultative
Course group:	C - przedmioty specjalnościowe
ECTS code:	06949-20-C
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	2 / 3

Type of course:
Lecture, Auditorium classes

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

Teaching forms and methods
Lecture(K1, W1) : , Auditorium classes(U1) :

Form and terms of the verification results:
LECTURE: Colloquium test - null(K1, U1, W1) ;AUDITORIUM CLASSES: Colloquium test - null(K1, U1, 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. Tomasz Pokój,

Course coordinators:

Notes:

ECTS code: AAABB-CD-E_F

AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Detailed description of the awarded ECTS points - part B

06949-20-C
ECTS:3
YEAR: 2019Z

DESIGNING OF AGRICULTURE BIOGAS PLANTS
DESIGNING OF AGRICULTURE BIOGAS PLANTS

The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

- participation in: auditorium classes	30 h
- participation in: lecture	15 h
- consultation	2 h
	47 h

2. Student's independent work:

-	13 h
-	10 h
-	20 h
	43 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 90 h : 25 h/ECTS = 3,60 ECTS
average: **3 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 1,88 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 1,12 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

06049-24-C
ECTS: 2
YEAR: 2019Z

ENGLISH FOR BIOTECHNOLOGISTS
ENGLISH FOR BIOTECHNOLOGISTS

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_K02+, T2A_K03+, T2A_K04+, T2A_K06+, T2A_U01+, T2A_U10+, T2A_W05+,
Codes of learning outcomes in a major area of study:	K2_K01+, K2_U01+, K2_W17+,

LEARNING OUTCOMES:

Knowledge

W1 - Knowledge of English subjects related to the field of undergraduate and a more detailed knowledge of issues related to the speciality number of Master

Skills

U1 - Mastering English-language vocabulary on the topic of the lectures

Social competence

K1 - Improving the practical use of research of scientific literature in learning the English language in scientific discussion

BASIC LITERATURE

1) Łuczyński M. , English Terminology in Biotechnology. Bilingual (in English with English-Polish dictionary for each topic), wyd. materials for internal use at the Department of Environmental Biotechnology. Available in electronic, 2016. , s. 136

SUPPLEMENTARY LITERATURE

Course / module
English for biotechnologists

Fields of education:
Obszar nauk technicznych

Course status:	facultative
Course group:	C - przedmioty specjalnościowe
ECTS code:	06049-24-C
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	1 / 2

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: Colloquium test - null(K1, U1, W1)

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 inż. Maciej Woźny,

Course coordinators:

Notes:
brak

ECTS code: AAABB-CD-E_F — AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Detailed description of the awarded ECTS points - part B

06049-24-C
ECTS:2
YEAR: 2019Z

ENGLISH FOR BIOTECHNOLOGISTS
ENGLISH FOR BIOTECHNOLOGISTS

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:

-	18 h
	18 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 50 h : 25 h/ECTS = 2,00 ECTS
average: **2 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 1,28 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 0,72 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

06949-20-C
ECTS: 4
YEAR: 2019Z

ENVIRONMENTAL BIOTECHNOLOGY
ENVIRONMENTAL 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_K03+, T2A_K07+, T2A_U02+, T2A_U12+, T2A_W04+, T2A_W07+,
Codes of learning outcomes in a major area of study:	K2_K01+, K2_K02+, K2_U02+, K2_U12+, K2_W11+, K2_W12+,

LEARNING OUTCOMES:

Knowledge

W1 - Students will have knowledge of the use of mixed microbial cultures in environmental protection. They will be able to describe mechanisms of nitrogen and phosphorus removal from wastewater and propose appropriate technological systems. They will be able to describe processes of wastewater treatment in bed biofilm reactors. They will have knowledge of technologies to convert waste to useful products (biogas, compost).

Skills

U1 - Students will be able to analyze wastewater chemical parameters and connect them with biological processes which occur in reactors.
U2 - They will be able to evaluate efficiency of wastewater treatment depending on reactor type. They will be able to calculate operational parameters and use them to control processes in bioreactors.

Social competence

K1 - Students will gain experience in working as an active member of a team.
K2 - They will gain understanding of the relationships between the development of biotechnology methods and improvement of the environment.

BASIC LITERATURE

1) Jördening H. J., Winter J. (Eds.) , Environmental Biotechnology: Concepts and Applications , wyd. Wiley-Blackwell, 2005 ; 2) Scragg A., Environmental Biotechnology, wyd. Oxford University Press, USA, 2005 ; 3) Evans G. G., Furlong J., Environmental Biotechnology: Theory and Application. , wyd. Wiley, 2010 ; 4) Vallero D. A., Environmental Biotechnology: A Biosystems Approach. , wyd. Academic Press, 2010 ; 5) Rittmann B. E., McCarty P. L., Environmental Biotechnology: Principles and Applications. , wyd. McGraw-Hill, 2001

SUPPLEMENTARY LITERATURE

1) Wang L. K., Ivanov V., Tay J.-H., Hung Y.-T., Environmental Biotechnology., wyd. Humana Press, 2010 ; 2) Kreith F., Goswami D.Y. (Edts.), Handbook of Energy Efficiency and Renewable Energy. , wyd. CRC Press Taylor & Francis Group, Boca Raton, USA, 2007 ; 3) Chen G.Q., Plastics from Bacteria. Natural Functions and Applications. , wyd. Springer-Verlag, Berlin Heidelberg, Germany, 2010

Course / module
Environmental biotechnology

Fields of education:
Obszar nauk technicznych

Course status:	mandatory
Course group:	C - przedmioty specjalnościowe
ECTS code:	06949-20-C
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	1 / 2

Type of course:
Laboratory classes, Lecture, Computer classes

Number of hours per semester/week:	Laboratory classes: 40, Lecture: 15, Computer classes: 5

Teaching forms and methods
Laboratory classes(K1, U1, U2) : , Lecture(K2, W1) : , Computer classes(U2) :

Form and terms of the verification results:
LABORATORY CLASSES: Write-up - null(K1, U1, U2) ;LABORATORY CLASSES: Colloquium test - null(K2, W1) ;LECTURE: Colloquium test - null(K2, W1)

Number of ECTS points:	4
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. Tomasz Pokój,

Course coordinators:

Notes:

ECTS code: AAABB-CD-E_F

AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Detailed description of the awarded ECTS points - part B

06949-20-C
ECTS:4
YEAR: 2019Z

ENVIRONMENTAL BIOTECHNOLOGY
ENVIRONMENTAL BIOTECHNOLOGY

The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

- participation in: computer classes	5 h
- participation in: laboratory classes	40 h
- participation in: lecture	15 h
- consultation	4 h
	64 h

2. Student's independent work:

-	25 h
-	10 h
-	16 h
	51 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 115 h : 25 h/ECTS = 4,60 ECTS
average: **4 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 2,56 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 1,44 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

06049-20-A
ECTS: 1
YEAR: 2019Z

ENVIRONMENTAL MANAGEMENT
ENVIRONMENTAL MANAGEMENT

COURSE CONTENT
CLASSES:

IPPC directive. BREF documents. BAT techniques in different kinds of enterprises. Environmental policy. Integrated permits. Environmental management system's documentary.

LECTURES:

Sustainable development conception. Idea of environmental management systems. Implementation of EMS. Deming's cycle. ISO standards about environmental management – ISO 14001 standards group. Environmental audits, certification audits, verification audits. Eco-management and audit scheme (EMAS).

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_K05+, T2A_K07+, T2A_U15+, T2A_W02+, T2A_W05+, T2A_W08+,
Codes of learning outcomes in a major area of study:	K2_K02+, K2_U08+, K2_W05+, K2_W17+,

LEARNING OUTCOMES:

Knowledge

W1 - A student gains principal informations about sustainable development, environmental policy and solution in the industry and in a small and middle enterprises
W2 - A student knows a documentation, an ISO standards

Skills

U1 - A student can identify significants environmental aspects in the different kinds of enterprises, have proper skills which can be used in the preparation of integrated permit applications

Social competence

K1 - A student possess the consciousness of environmental consequences of entrepreneurship and also have a need to self-improvement it this area of knowledge

BASIC LITERATURE

1) ISO, ISO 14001 group standards, wyd. ISO, 2004 ; 2) UE, BREF documents published on Ministry of Environmental Protection page (www.mos.gov.pl), wyd. UE, 2004 ; 3) UE, EMAS Regulation text (www.mos.gov.pl), wyd. UE, 2004 ; 4) UE, IPPC Directive text (www.mos.gov.pl), wyd. UE, 2004

SUPPLEMENTARY LITERATURE

Course / module
Environmental management
Fields of education:
Obszar nauk technicznych

Course status:	mandatory
Course group:	A - przedmioty podstawowe
ECTS code:	06049-20-A
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	1 / 2

Type of course:
Auditorium classes

Number of hours per semester/week:	Auditorium classes: 15

Teaching forms and methods
Auditorium classes(K1, U1, W1, W2) :
Form and terms of the verification results:
AUDITORIUM CLASSES: Prezentation - null(K1, U1, W1, W2)

Number of ECTS points:	1
Language of instruction	angielski

Introductory courses:

Preliminary requirements:

Name of the organizational unit offering the course:
Katedra Inżynierii Ochrony Wód,
Person in charge of the course:
dr inż. Renata Augustyniak,
Course coordinators:

Notes:

ECTS code: AAABB-CD-E_F — AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Detailed description of the awarded ECTS points - part B

06049-20-A
ECTS:1
YEAR: 2019Z

ENVIRONMENTAL MANAGEMENT
ENVIRONMENTAL MANAGEMENT

The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

- participation in: auditorium classes	15 h
- consultation	2 h
	17 h

2. Student's independent work:

- preparing presentation	8 h
	8 h

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

- including the number of ECTS points for contact hours with direct participation of the academic teacher:	0,68 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work:	0,32 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

09149-24-C
ECTS: 2
YEAR: 2019Z

GERMAN FOR BIOTECHNOLOGISTS
GERMAN FOR BIOTECHNOLOGISTS

COURSE CONTENT
CLASSES:

Teaching contents in accordance with the German language curriculum for the first semester of the B2 + level, according to the table of requirements of the European System of Language Description (CEFR), in cycle 1 x 30 h = 30 h; analysis and work with specialist texts in German; translation of texts and articles in the field of biotechnology in environmental engineering from Polish into German and from German into Polish

LECTURES:

not applicable

EDUCATIONAL OBJECTIVE:

Developing language competences that allow students to understand, translate and use German specialist linguistics in the field of biotechnology in environmental engineering

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_U03+, T2A_U04+, T2A_U06++, T2A_W05+,
Codes of learning outcomes in a major area of study:	K2_K03+, K2_U04+, K2_U16+, K2_W17+,

LEARNING OUTCOMES:

Knowledge

W1 - The student has the knowledge necessary to understand and formulate statements in German, containing specialist lexicon in the field of a given field of study, according to the table of requirements for the B2 + CEFR level and in proportion to the number of hours planned.

Skills

U1 - The student is able to use specialized terminology in the field of study, in proportion to the number of hours planned, the student reads with understanding and critically analyzes texts containing specialized lexicon in the field of study;

Social competence

K1 - The student understands the importance of foreign language skills, including German as one of the conference languages; appreciates the importance of foreign language skills as an element allowing for a better position in the conditions of growing competition on the labor market

BASIC LITERATURE

1) Joanna Küchler-Krischun, Alfred Maria Walter, Nationale Strategie zur biologischen Vielfalt, wyd. BMU, 2011

SUPPLEMENTARY LITERATURE

1) , Słownik polsko-niemiecki i niemiecko-polski

Course / module
German for biotechnologists

Fields of education:
Obszar nauk technicznych

Course status:	facultative
Course group:	C - przedmioty specjalnościowe
ECTS code:	09149-24-C
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	1 / 2

Type of course:
Auditorium classes

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

Teaching forms and methods

Auditorium classes(K1, U1, W1) : Communicative method with elements of the grammatical-translation method

Form and terms of the verification results:

AUDITORIUM CLASSES: Evaluation of the work and cooperation in the group - The student is assessed on a scale of 2-5 for activity, creativity and correctness of tasks in the group(K1, U1, W1) ;AUDITORIUM CLASSES: Written test - Conducting at least two written tests consisting in solving by the student the tasks checking the degree of mastery of the lexical and grammatical material on a scale of 2-5(K1, U1, W1)

Number of ECTS points:	2
Language of instruction	angielski

Introductory courses:
none

Preliminary requirements:
declared knowledge of German at B2 level

Name of the organizational unit offering the course:

Zespół Języka Angielskiego, , Zespół Języka Niemieckiego,

Person in charge of the course:

mgr Anna Żebrowska, , mgr Renata Żebrowska,

Course coordinators:

Notes:

ECTS code: AAABB-CD-E_F

AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Detailed description of the awarded ECTS points - part B

09149-24-C
ECTS:2
YEAR: 2019Z

GERMAN FOR BIOTECHNOLOGISTS
GERMAN FOR BIOTECHNOLOGISTS

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:

- preparation for tests	6 h
- preparing for exercises, doing housework and presentations	12 h
	18 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 50 h : 25 h/ECTS = 2,00 ECTS
average: **2 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 1,28 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 0,72 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

06049-24-C
ECTS: 3
YEAR: 2019Z

INFORMATIVE TECHNIQUES IN ENVIRONMENTAL BIOTECHNOLOGY
INFORMATIVE TECHNIQUES IN ENVIRONMENTAL 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_U01+, T2A_U03++, T2A_U04++, T2A_U06+, T2A_U10+, T2A_W01+, T2A_W05+,
Codes of learning outcomes in a major area of study:	K2_K03+, K2_U01+, K2_U03+, K2_U04+, K2_W01+, K2_W17+,

LEARNING OUTCOMES:

Knowledge

W1 - The student will know how useful in current biotechnology and molecular genetic are bioinformatics techniques
W2 - The student will know how important are using them in various areas of molecular genetic. The student will know what are the contributions of using a bioinformatics tools in conservation genetic or other fields of biological sciences

Skills

U1 - The student can find and design a set or sets of primers for amplify a DNA fragments by using PCR technique. The student can read and evaluate the results of sequencing, SNP analysis. The student can convert a type of input file between various computer tools applied in molecular genetic. The student can calculate and evaluate a indicators of genetic variation by using various software. The student can asses a genetic distance between populations and can construct the phylogenetic tree and evaluate a phylogenetic distance
U2 - The student can prepare the genetic profiles of individuals that are intended to be berrd and identify a set optimal pairs among them. The student can measure the length of DNA fragments by using automatic capillary sequencer and software. The student can asses the results of genetic variation analysis

Social competence

K1 - The student will be able to propose a appropriate set of molecular analysis to reach the objectives of conservation programs. The student will be able to decide if conservation programs are effective or not. The student will be able to evaluate genetic similarity between populations and propose a optimal conservation strategy. The student will be able to optimize and adopt a various molecular and bioinformatics techniques to increase efficiency and decrease a costs of conservation programs

BASIC LITERATURE

1) Dieringer D., Schlötterer C. , Microsatellite analyzer (MSA): a platform independent analysis tool for large microsatellite data sets. , wyd. Molecular Ecology Notes, 2003, t. 3, s. 167-169; 2) Excoffier L., Laval G., Schneider S. , An integrated software package for population genetics data analysis, wyd. Evolutionary Bioinformatics Online, 2005, t. 1, s. 47-50; 3) Excoffier L., Smouse P., Quattro J. , Analysis of molecular variance inferred from metric distances among DNA haplotypes: Application to human mitochondrial DNA restriction data, wyd. Genetics, 1992, t. 131, s. 479-491; 4) Kaczmarczyk D., Kaczor A., New multiplex PCR assays for estimating genetic diversity in rainbow trout (Oncorhynchus mykiss) by polymorphism of microsatellite DNA, wyd. Environmental Biotechnology , 2009, t. 1, s. 19-24; 5) Schoske R., Vallone P. M., Ruitberg C. M., Butler J. M. , Multiplex PCR design strategy used for the simultaneous amplification of 10 Ychromosome short tandem repeat (STR) loci. , wyd. Analytical and Bioanalytical Chemistry, , 2003, t. 375, s. 333-343

SUPPLEMENTARY LITERATURE

1) Guo S.W., Thompson E.A. , Performing the exact test of Hardy-Weinberg proportion for multiple alleles., wyd. Biometrics, 1992, t. 48, s. 361–372; 2) Goldstein D.B., Ruiz Linares A., Cavalli-Sforza L.L, Feldman M.W. , An evaluation of genetic distances for use with microsatellite loci. , wyd. Genetics, 1993, t. 139, s. 463-471; 3) Ramaswamy, S.V., , Single Nucleotide Polymorphisms in Genes Associated with Isoniazid Resistance in Mycobacterium tuberculosisn antimicrob, wyd. Agents Chemother, 2003, t. 47, s. 1241-1250

Course / module
Informative techniques in environmental biotechnology

Fields of education:
Obszar nauk technicznych

Course status:	facultative
Course group:	C - przedmioty specjalnościowe
ECTS code:	06049-24-C
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	2 / 3

Type of course:
Lecture, Computer classes

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

Teaching forms and methods
Lecture(K1, W1, W2) : , Computer classes(U1, U2) :

Form and terms of the verification results:
LECTURE: Colloquium test - null(K1, U1, U2, W1, W2) ;COMPUTER CLASSES: Colloquium test - null(K1, U1, U2, W1, W2)

Number of ECTS points:	3
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 inż. Dariusz Kaczmarczyk,

Course coordinators:

Notes:
The classes should be performed in small groups

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Detailed description of the awarded ECTS points - part B

06049-24-C
ECTS:3
YEAR: 2019Z

INFORMATIVE TECHNIQUES IN ENVIRONMENTAL BIOTECHNOLOGY

INFORMATIVE TECHNIQUES IN ENVIRONMENTAL BIOTECHNOLOGY

The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

- participation in: computer classes	30 h
- participation in: lecture	15 h
- consultation	2 h
	47 h

2. Student's independent work:

-	9 h
-	9 h
	18 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 65 h : 25 h/ECTS = 2,60 ECTS
average: **3 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 1,88 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 1,12 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

01049-20-C
ECTS: 3
YEAR: 2019Z

INTRODUCTION TO NANOBIOTECHNOLOGY
INTRODUCTION TO NANOBIOTECHNOLOGY

COURSE CONTENT
CLASSES:

Bioreduction. Biosynthesis of nanoparticles (nanosilver or nanogold particles). Properties of nanoparticles. Antimicrobial properties of nanosilver. Application of nanoparticles. Immobilization of enzymes on nanoparticles. Analysis of nanobiocatalyst properties. Synthesis of biodiesel with nanobiocatalyst. Valorization of whey permeate. Biosynthesis of galactooligosaccharides. Utilization of atomic force microscopy (ATM) for nanoparticle characterization. Application of different techniques of analysis. Micelles, microemulsions and nanoemulsions preparation. Liposomes preparation.

LECTURES:

The objective of the course is to endow an overview of the fundamental concepts of modern nanobiotechnology and to discuss the risks and benefits of its application in the areas of health, food agriculture and forensic science. Emphasis will be placed on the melding of nanofabrication and biosystems and the current and future trends of nanobiotechnology. The possible effects that the use of nanotechnological materials and devices will have on the environment will be presented.

EDUCATIONAL OBJECTIVE:

The aim of the course is to introduce the fundamental concepts of nanotechnology to the students.

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_U03+, T2A_U04+, T2A_U08++, T2A_W01++, T2A_W02++,
Codes of learning outcomes in a major area of study:	K2_K01++, K2_K03++, K2_U04+, K2_U06++, K2_W02++, K2_W06++,

LEARNING OUTCOMES:

Knowledge

W1 - The studens will gain sufficient of nanoscience and nanotechology-related vocabulary to enable effective communication with practitioners in a diverse range of literate fields, including materials science and engineering, biomaterials engineering
W2 - Acquire a general knowledge to synthesize nanomaterials and understand their nanoscale properties
W3 - Acquire insight into how macroscopic properties can be changed via nanoscale engineering and molecular level manipulation
W4 - Acquire fundamental knowledge of nanotechnology principles and applications

Skills

U1 - Be able to critically evaluate nanotechnology concepts and therefore be equipped to delve deeper into nanotechnology research
U2 - Acquire knowledge of basic approaches to synthesize inorganic colloidal nanoparticles
U3 - - Demonstrate understanding techniques of microscopy for investigations on the nanometre and atomic scales

Social competence

K1 - Understand the influence of nanobiotechnology on materials properties and environment
K2 - Understand the physical and chemical properties of carbon nanotubes and nanostructured materials
K3 - Apply ethical principles and legislation to the area of nanoscience and nanotechnology

BASIC LITERATURE

1) Niemeyer C.M., Mirkin C.A., Nanobiotechnology: Concepts, Applications and Perspectives, wyd. Wiley-VCH, 2004 ; 2) Mirkin C.A., Niemeyer C.M., Nanobiotechnology - II more concepts and applications, wyd. Wiley-VCH, 2007 ; 3) Goodsell S.D., Bionanotechnology, Lessons from Nature, wyd. Wiley-Liss Inc., 2004 ; 4) Shoseyov O., Levy I., Nanobiotechnology-BioInspired Devices and Materials of the Future, wyd. Humana Press Inc., 2008 ; 5) Reisner D.E., Bionanotechnology- Global Prospects, wyd. Taylor & Francis Group LLC, 2009 ; 6) Koch C.C., Nanostructured Materials: Processing, Properties and Potential Applications, wyd. Noves Publications, 2002

SUPPLEMENTARY LITERATURE

1) Freitas Jr. R.A., Nanomedicine, Volume I: Basic Capabilities, wyd. Landes Bioscience, 1999 ; 2) Yao N., Wang Z.L., Handbook Of Microscopy For Nanotechnology, wyd. Kluwer Academic Publishers, 2005

Course / module
Introduction to nanobiotechnology

Fields of education:
Obszar nauk technicznych

Course status:	facultative
Course group:	C - przedmioty specjalnościowe
ECTS code:	01049-20-C
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	2 / 3

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) : 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	polski

Introductory courses:
biochemistry, chemistry, enzymology

Preliminary requirements:
biochemistry, chemistry, process engineering

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:

Notes:

ECTS code: AAABB-CD-E_F

AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Detailed description of the awarded ECTS points - part B

01049-20-C
ECTS:3
YEAR: 2019Z

INTRODUCTION TO NANOBIOTECHNOLOGY
INTRODUCTION TO NANOBIOTECHNOLOGY

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	2 h
	47 h

2. Student's independent work:

- prepare for classes	13 h
- prepare for tests	20 h
- prepare reports from experiments	10 h
	43 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 90 h : 25 h/ECTS = 3,60 ECTS

average: **3 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 1,88 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 1,12 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

06049-20-C
ECTS: 3
YEAR: 2019Z

MEMBRANE TECHNIQUES IN ENVIRONMENTAL ENGINEERING
MEMBRANE TECHNIQUES IN ENVIRONMENTAL ENGINEERING

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_U12+, T2A_U17+, T2A_U19++, T2A_W03+, T2A_W07+,
Codes of learning outcomes in a major area of study:	K2_K01+, K2_K02+, K2_K03+, K2_U02+, K2_U04+, K2_U12+, K2_U14+, K2_U16+, K2_W09+, K2_W12+,

LEARNING OUTCOMES:

Knowledge

W1 - Defines techniques of mixture separation. Defines and characterizes membrane processes. Explains the phenomena causing a lowering of the rate of membrane filtration
W2 - He knows the terminology related to the designing technological systems for water and wastewater treatment

Skills

U1 - Evaluates the quality of water and wastewater for its treatment with the use of membrane techniques
U2 - Selects of technologies using membrane processes and indicates the criteria for the selection of hybrid processes for removing various contaminants from water and wastewater
U3 - Calculates parameters of the membrane reactors using professional language

Social competence

K1 - He is aware of the need to introduce technology to prevent environmental degradation
K2 - He is aware of the need for self-education

BASIC LITERATURE

1) different authors, Materials and laboratory protocols given by a teacher., wyd. author's script, 2018

SUPPLEMENTARY LITERATURE

Course / module
Membrane techniques in environmental engineering

Fields of education:
Obszar nauk technicznych

Course status:	mandatory
Course group:	C - przedmioty specjalnościowe
ECTS code:	06049-20-C
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	1 / 2

Type of course:
Laboratory classes, Lecture, Auditorium classes

Number of hours per semester/week:	Laboratory classes: 5, Lecture: 15, Auditorium classes: 25

Teaching forms and methods
Laboratory classes(K1, K2, U1) : , Lecture(K1, K2, W1, W2) : , Auditorium classes(K1, K2, U2, U3) :

Form and terms of the verification results:
LABORATORY CLASSES: Report - null(K1, K2, U1) ;LECTURE: Colloquium test - null(K1, K2, W1, W2) ;AUDITORIUM CLASSES: Project - null(K1, K2, U2, U3)

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. Magdalena Zielińska,

Course coordinators:

Notes:

ECTS code: AAABB-CD-E_F

AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Detailed description of the awarded ECTS points - part B

06049-20-C
ECTS:3
YEAR: 2019Z

MEMBRANE TECHNIQUES IN ENVIRONMENTAL ENGINEERING
MEMBRANE TECHNIQUES IN ENVIRONMENTAL ENGINEERING

The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

- participation in: auditorium classes	25 h
- participation in: laboratory classes	5 h
- participation in: lecture	15 h
- consultation	2 h
	47 h

2. Student's independent work:

-	43 h
	43 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 90 h : 25 h/ECTS = 3,60 ECTS
average: **3 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 1,88 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 1,12 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

MICRORGANISMS IN INDUSTRY
MICRORGANISMS IN INDUSTRY

06049-20-C
ECTS: 3
YEAR: 2019Z

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_U03+, T2A_U04+, T2A_U06+, T2A_U08+, T2A_W01+, T2A_W02+,
Codes of learning outcomes in a major area of study:	K2_K03+, K2_U04+, K2_U06+, K2_W02+, K2_W06+,

LEARNING OUTCOMES:

Knowledge

W1 - Student should acquire knowledge concerning methods of industrial cultivation of microorganisms
W2 - Student will know methods of bioproducts extraction and purification

Skills

U1 - Student should acquire skills of bacterial cultivation and monitoring of bacterial growth
U2 - Student should acquire basic skills of fermentation products purification

Social competence

K1 - Student should acquire ability to prepare and present the aims and methods of biotechnological projects

BASIC LITERATURE

1) Glick B., Pasternak J.J., Author I., Molecular biotechnology : principles and applications of recombinant DNA, wyd. ASM Press, 2010 , s. 1020pp; 2) Mousdale, D.M.,, Biofuels : biotechnology, chemistry and sustainable development, wyd. Science, 2008 , s. 424; 3) Waites M. J., Morgan N. L., John S. Rockey J.S., Higton G., Industrial Microbiology: An Introduction, wyd. Wiley-Blackwell, , 2001 , s. 304pp

SUPPLEMENTARY LITERATURE

Course / module
Microrganisms in industry

Fields of education:
Obszar nauk technicznych

Course status:	facultative
Course group:	C - przedmioty specjalnościowe
ECTS code:	06049-20-C
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	2 / 3

Type of course:
Laboratory classes, Lecture

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

Teaching forms and methods
Laboratory classes(K1, U1, U2) : , Lecture(W1, W2) :

Form and terms of the verification results:
LABORATORY CLASSES: Report - null(K1, U1, U2) ;LABORATORY CLASSES: Colloquium test - null(W1, W2) ;LECTURE: Colloquium test - null(W1, W2)

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. Sławomir Ciesielski, prof. UWM

Course coordinators:

Notes:
brak

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Detailed description of the awarded ECTS points - part B

06049-20-C
ECTS:3
YEAR: 2019Z

MICRORGANISMS IN INDUSTRY
MICRORGANISMS IN INDUSTRY

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	2 h
	47 h

2. Student's independent work:

-	10 h
-	13 h
-	10 h
-	10 h
	43 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 90 h : 25 h/ECTS = 3,60 ECTS
average: **3 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 1,88 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 1,12 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

13049-20-C
ECTS: 3
YEAR: 2019Z

MODELING OF SELECTED BIOTECHNOLOGICAL PROCESSESS
MODELING OF SELECTED BIOTECHNOLOGICAL PROCESSESS

COURSE CONTENT
CLASSES:

Introduction to the models ASM and ADM. Fractionation of the particulate and soluble organic matter in wastewater and feedstocks. Kinetic coefficients of models. Acquaintance with modeling software. Evaluation of model usability to simulate processes in wastewater treatment plant and biogas plant.

LECTURES:

Design of wastewater treatment plant and biogas plant with simulation models. Characteristics of ASM and ADM simulation models. Distribution of organic matter in wastewaters and feedstocks. Structure of biochemical reactions and physico-chemical processes. Identification of parameters. Models implementation.

EDUCATIONAL OBJECTIVE:

The aim is to obtain a knowledge about modelling the main processes in wastewater tretament plant and biogas plant.

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_K04+, T2A_K06+, T2A_U03+, T2A_U06+, T2A_W01+, T2A_W02+,
Codes of learning outcomes in a major area of study:	K2_K01+, K2_K03+, K2_U04+, K2_W01+, K2_W06+,

LEARNING OUTCOMES:

Knowledge

W1 - Students will have knowledge about structure of model simulating of processes in wastewater treatment plant and biogas plant.

Skills

U1 - Students will prepare the matrix of components. Students will interpret the results of simulations, which can be used to predict the effects of wastewater treatment processes and biogas production

Social competence

K1 - Students are aware of the significance of modelling of biotechnological processes

BASIC LITERATURE

1) Henze M., Grady C.P.L., Gujer W., Marias G.v.R., Matsuo T., Activated Sludge Models ASM1, ASM2, ASM2d and ASM3, wyd. IWA Publishing, 2000 ; 2) Batstone D.J., Keller J., Angelidaki I., Kalyuzhnyi S.V., Pavlostathis S.G., Rozzi A., Sanders W.T.M, Anaerobic Digestion Model No. 1, wyd. IWA Publishing, 2002

SUPPLEMENTARY LITERATURE

1) Rieger L., Gillot S., Langergraber G., Ohtsuki T., Shaw A., Takacs I., Winkler S., Guidelines for Using Activated Sludge Models, wyd. IWA Publishing, 2012 ; 2) Henze M., Biological Wastewater Treatment: Principles, Modelling and Design, wyd. IWA Publishing, 2008

Course / module

Modeling of selected biotechnological processess

Fields of education:

Obszar nauk technicznych

Course status:	facultative
Course group:	C - przedmioty specjalnościowe
ECTS code:	13049-20-C
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	2 / 3

Type of course:

Lecture, Auditorium classes

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

Teaching forms and methods

Lecture(W1) : multimedia presentation, Auditorium classes(K1, U1) : Computer laboratory classes

Form and terms of the verification results:

LECTURE: Colloquium test - test(K1, U1, W1) ;AUDITORIUM CLASSES: Colloquium test - Test(K1, U1, W1)

Number of ECTS points:	3
Language of instruction	angielski

Introductory courses:

none

Preliminary requirements:

none

Name of the organizational unit offering the course:

Katedra Biotechnologii w Ochronie Środowiska,

Person in charge of the course:

dr inż. Katarzyna Bułkowska,

Course coordinators:

Notes:

brak

ECTS code: AAABB-CD-E_F

AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Detailed description of the awarded ECTS points - part B

13049-20-C
ECTS:3
YEAR: 2019Z

MODELING OF SELECTED BIOTECHNOLOGICAL PROCESSESS
MODELING OF SELECTED BIOTECHNOLOGICAL PROCESSESS

The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

- participation in: auditorium classes	30 h
- participation in: lecture	15 h
- consultation	2 h
	47 h

2. Student's independent work:

- preparation to classes	23 h
- preparation to tests	20 h
	43 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 90 h : 25 h/ECTS = 3,60 ECTS
average: **3 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 1,88 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 1,12 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

06049-20-C
ECTS: 3
YEAR: 2019Z

MOLECULAR DIAGNOSTICS
MOLECULAR DIAGNOSTICS

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_U08++, T2A_W01+, T2A_W02+,
Codes of learning outcomes in a major area of study:	K2_K01+, K2_K03+, K2_U06++, K2_W03+, K2_W06+,

LEARNING OUTCOMES:

Knowledge

W1 - The student will know what is genetic variation and why it is important for conservation of species
W2 - The student whill know what is microsatellite DNA and what information about genetic strusture of population can be read from polymorphism of those fragments of DNA. The student wil know what are PCR RFLP technigue, and measurement a fragments of DNA usung automatic DNA sequncer. The student will know what kinds of molecular tests can be used in detection of diseases and animals that enable a transfer of comertially important traits to future generations

Skills

U1 - The student will be able to apply a techniques of molecular genetic as a tool in detection of animal diseases and commercially important traits
U2 - The student can estimate a level of genetic variation within population and between populations. The student will interpretate a indicators of genetic variation, and detect the factors that might affect the level of genetic variability in conserved population. The student will be able to prepare a genetic profile of individuals and use them in conservation of species as well in commercial breedieng. The student will be able to asses interpopulation deiversity and propose the method to prevent it decrease

Social competence

K1 - The student will propose a appropirate strategy of conservation a species.The student wil be able to decide how to increase a possibility of succes in conservation of biodiversity and deduce a cost of those procedures
K2 - The student will be able to find a method of conservation of genetic wariation in the human dependant population as well in commercial stocks. The student will know how to use an genetic tests in detection of animal diseases or individuals that are an geneticaly valuable for breeding. The student will be able to asses a relationship between populations and propose apropirate technique to protec a genetic diversity of the species

BASIC LITERATURE

1) Levin B., Genes VIII, wyd. Pearson Prentice Hall, 2004 , s. 1003p; 2) Hartl D. E., Jones E. W. , Genetics: Principles and Analysis, wyd. Jones and Bartlett Publishers, 1998 , s. 1298p; 3) R. Levis., Human Genetics (Concepts and Applications) fifth edition Mc Graw-Hill Companies, wyd. Boston USA, 2003

SUPPLEMENTARY LITERATURE

1) Ellegren H., Microsatellite evolution: a battle between replication slippage and point mutations, wyd. Trends in Genetics, 2002, t. 18, s. 17

Course / module
Molecular Diagnostics

Fields of education:
Obszar nauk technicznych

Course status:	facultative
Course group:	C - przedmioty specjalnościowe
ECTS code:	06049-20-C
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	2 / 3

Type of course:
Laboratory classes, Lecture

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

Teaching forms and methods
Laboratory classes(U1, U2) : , Lecture(K1, K2, W1, W2) :

Form and terms of the verification results:
LABORATORY CLASSES: Colloquium test - null(K1, K2, U1, U2, W1, W2) ;LECTURE: Colloquium test - null(K1, K2, U1, U2, W1, W2)

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 inż. Dariusz Kaczmarczyk,

Course coordinators:

Notes:
The classes should be performed in small groups

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Detailed description of the awarded ECTS points - part B

06049-20-C
ECTS:3
YEAR: 2019Z

MOLECULAR DIAGNOSTICS
MOLECULAR DIAGNOSTICS

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	2 h
	47 h

2. Student's independent work:

-	15 h
-	15 h
-	13 h
	43 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 90 h : 25 h/ECTS = 3,60 ECTS
average: **3 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 1,88 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 1,12 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

06949-20-B
ECTS: 3
YEAR: 2019Z

RENEWABLE SOURCES OF ELECTRICAL ENERGY
RENEWABLE SOURCES OF ELECTRICAL ENERGY

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_K02+, T2A_U10+, T2A_W05+,
Codes of learning outcomes in a major area of study:	K2_K01+, K2_U07+, K2_W07+,

LEARNING OUTCOMES:

Knowledge

W1 - A student knows environmentally friendly technologies with the use of unconventional energy sources

Skills

U1 - A student applies calculations regarding the efficiency and the possibility of using renewable energy sources

Social competence

K1 - A student expresses the assessment of the impact of techniques used in obtaining energy on the environment. He is open to technical initiatives and innovations.

BASIC LITERATURE

1) Jenkins N., Ekanayake J., Renewable Energy Engineering 1st Edition, wyd. Cambridge University Press, 2017 ; 2) Da Rosa A.V., Fundamentals of Renewable Energy Processes 3rd Edition, wyd. Academic Press, 2012 ; 3) ZOBAA A.F., BANSAL R.C. (Eds.), Handbook of Renewable Energy Technology 1st edition, wyd. World Scientific Publishing Company, 2011 ; 5) Ehrlich R., Geller H.A., Renewable Energy: A First Course 2nd Edition, wyd. CRC Press, 2017

SUPPLEMENTARY LITERATURE

1) Hagen Kirk D, Introduction to Renewable Energy for Engineers, wyd. Pearson Education. Inc., 2016 ; 2) Siegenthaler J., Heating with Renewable Energy; 1 edition, wyd. Cengage Learning, 2016 ; 3) Tiwari G.N., Mishra R.K., Advanced Renewable Energy Sources: RSC , wyd. Royal Society of Chemistry, 2011 ; 4) Nelson V.C. , Introduction to Renewable Energy (Energy and the Environment) 1st Edition, wyd. CRC Press, 2011 ; 5) Goodstal G. , Electrical Theory for Renewable Energy (Go Green with Renewable Energy Resources) 1st Edition, wyd. Cengage Learning, 2012

Course / module
Renewable sources of electrical energy

Fields of education:
Obszar nauk technicznych

Course status:	mandatory
Course group:	B - przedmioty kierunkowe
ECTS code:	06949-20-B
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	1 / 2

Type of course:
Lecture, Auditorium classes

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

Teaching forms and methods
Lecture(K1, W1) : , Auditorium classes(U1) :

Form and terms of the verification results:
LECTURE: Colloquium test - null(K1, U1, W1) ;AUDITORIUM CLASSES: Colloquium test - null(K1, U1, W1)

Number of ECTS points:	3
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. Tomasz Pokój,

Course coordinators:

Notes:

ECTS code: AAABB-CD-E_F

AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Detailed description of the awarded ECTS points - part B

06949-20-B
ECTS:3
YEAR: 2019Z

RENEWABLE SOURCES OF ELECTRICAL ENERGY
RENEWABLE SOURCES OF ELECTRICAL ENERGY

The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

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

2. Student's independent work:

- preparation for exercises	8 h
- preparation for passing the course	8 h
- preparation for tests	10 h
	26 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 75 h : 25 h/ECTS = 3,00 ECTS
average: **3 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 1,96 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 1,04 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

13049-20-A
ECTS: 3
YEAR: 2019Z

STATISTICS IN ENVIRONMENTAL SCIENCES
STATISTICS IN ENVIRONMENTAL SCIENCES

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_K05+, T2A_K07+, T2A_U08+, T2A_W01+,
Codes of learning outcomes in a major area of study:	K2_K02+, K2_U06+, K2_W01+,

LEARNING OUTCOMES:

Knowledge

W1 - The Student knows and describes statistical approaches to specific environmental problems, knows a role statiscics play in environmental science

Skills

U1 - The Student collects data and uses sampling and experimental design. The student interprets results from approaches used in monitoring, impact assessment, and risk assessment procedures

Social competence

K1 - Student demonstrates an active attitude with respect to the local and global environmental problems. Students update their knowledge of key topics related to environmental sciences

BASIC LITERATURE

1) Manly, B.F. J., Statsitics for environmental science and management, wyd. 2nd ed. Chapman and Hall, 2010, t. 2, s. 1-295; 2) Walker C. H., Hopkin S. P., Sibly R. M., Peakall B, Principles of Ecotoxicology, wyd. CRC Press, 2005

SUPPLEMENTARY LITERATURE

1) Penningroth, S, Essentials of toxic chemical risk-science and society, wyd. CRC Press , 2010 , s. 1-294; 2) Eason, G., Coles, C.W., Gettinby, G. , Mathematics and Statistics for the Bio-sciences, wyd. Ellis Horwood, 1992

Course / module
Statistics in environmental sciences

Fields of education:
Obszar nauk technicznych

Course status:	mandatory
Course group:	A - przedmioty podstawowe
ECTS code:	13049-20-A
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	1 / 2

Type of course:
Computer classes

Number of hours per semester/week: Computer classes: 45

Teaching forms and methods
Computer classes(K1, U1, W1) :

Form and terms of the verification results:
COMPUTER CLASSES: Colloquium test - null(K1, U1, W1)

Number of ECTS points: 3

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:
prof. dr hab. Paweł Brzuzan,

Course coordinators:

Notes:
brak

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Detailed description of the awarded ECTS points - part B

13049-20-A
ECTS:3
YEAR: 2019Z

STATISTICS IN ENVIRONMENTAL SCIENCES
STATISTICS IN ENVIRONMENTAL SCIENCES

The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

- participation in: computer classes	45 h
- consultation	2 h
	47 h

2. Student's independent work:

-	10 h
-	18 h
-	15 h
	43 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 90 h : 25 h/ECTS = 3,60 ECTS
average: **3 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 1,88 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 1,12 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

06049-20-C
ECTS: 2
YEAR: 2019Z

TECHNOLOGIES OF ALGE BIOMASS PRODUKTION
TECHNOLOGIES OF ALGE BIOMASS PRODUKTION

COURSE CONTENT
CLASSES:

Algae – characteristics. Possibility of algae biomass use. Technological parameters of the algae biomass cultivation. Systems for algae biomass cultivation: raceways reactors, foto-bioreactors, hybrid reactors. Systems for algae biomass separation: filtration, membrane systems, centrifuge.

LECTURES:

-

EDUCATIONAL OBJECTIVE:

The aim of educational objective is to familiarize with the topic such as Algae – characteristics. Possibility of algae biomass use. Technological parameters of the algae biomass cultivation. Systems for algae biomass cultivation: raceways reactors, foto-bioreactors, hybrid reactors. Systems for algae biomass separation: filtration, membrane systems, centrifuge.

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_K07+, T2A_U02+, T2A_U04+, T2A_U06+, T2A_U10++, T2A_U19+, T2A_W03+, T2A_W05+,
Codes of learning outcomes in a major area of study:	K2_K01+, K2_K02+, K2_K03+, K2_U02+, K2_U04+, K2_U10+, K2_U12+, K2_U14+, K2_U16+, K2_W07+, K2_W09+,

LEARNING OUTCOMES:

Knowledge

W1 - student lists methods of algae biomass cultivation
W2 - Students list methods of algae biomass separation¬

Skills

U1 - Students can calculate technological parameters of algae cultivation systems
U2 - Students can calculate technological parameters of algae separation systems.

Social competence

K1 - The student is aware of the need for self-education. The student understands the rules for the use of natural resources

BASIC LITERATURE

1) Bux Faizal, , Algae Biotechnology , wyd. Springer International Publishing AG, , 2015 ; 2) DĘBOWSKI M., ZIELIŃSKI M., GRALA A., DUDEK M., , Algae biomass as an alternative substrate in biogas production technologies – review, wyd. ., Renewable and Sustainable Energy Reviews 27, 2013

SUPPLEMENTARY LITERATURE

1) Ashok Pandey, Duu-Jong Lee, Yusuf Chisti and Carlos R Soccol, Biofuels from Algae, wyd. Elsevier B.V, , 2014 ; 2) Carl J. Soeder , Gedaliah Shelef, Algae Biomass: Production and Use , wyd. Elsevier Science Ltd, , 1980

Course / module
Technologies of alge biomass produktion

Fields of education:
Obszar nauk technicznych

Course status:	mandatory
Course group:	C - przedmioty specjalnościowe
ECTS code:	06049-20-C
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	1 / 2

Type of course:
Laboratory classes

Number of hours per semester/week:	Laboratory classes: 30

Teaching forms and methods
Laboratory classes(K1, U1, U2, W1, W2) : project classes

Form and terms of the verification results:
LABORATORY CLASSES: Colloquium practical - null(K1, U1, U2, W1, W2)

Number of ECTS points:	2
Language of instruction	polski

Introductory courses:
basics knowledge from water and wastewater technology

Preliminary requirements:
-

Name of the organizational unit offering the course:
Katedra Inżynierii Środowiska,

Person in charge of the course:
dr hab. inż. Marcin Zieliński, prof. UWM

Course coordinators:

Notes:
-

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Detailed description of the awarded ECTS points - part B

06049-20-C
ECTS:2
YEAR: 2019Z

TECHNOLOGIES OF ALGE BIOMASS PRODUKTION
TECHNOLOGIES OF ALGE BIOMASS PRODUKTION

The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

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

2. Student's independent work:

- preparing for classes	24 h
- preparing for test	4 h
	28 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 60 h : 25 h/ECTS = 2,40 ECTS
average: **2 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 1,28 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 0,72 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

TECHNOLOGIES OF BIOPOLYMER PRODUCTION

06949-20-C
ECTS: 3
YEAR: 2019Z

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_K03+, T2A_K07+, T2A_U02+, T2A_U12+, T2A_W07+,
Codes of learning outcomes in a major area of study:	K2_K01+, K2_K02+, K2_U02+, K2_U12+, K2_W12+,

LEARNING OUTCOMES:

Knowledge

W1 - Students will have knowledge of the application of technological strategies compatible with the concept of sustainable development for example production of biodegradable polymers as packaging materials. They will be able to describe properties and applications of polylactic acid, starch and polyhydroxyalkanoates. They will have knowledge of biochemical fundaments of PHAs synthesis using pure and mixed microbial cultures. They will be able to decribe fermentative production of short-chain-length and medium-chain-length PHAs and their copolymers.

Skills

U1 - Students will be able to perform bath culture of activated sludge for polyhydroxyalkanoates production. They will be able to analyse type and concentration of PHAs using gas chromatography method .
U2 - They will be able to determine kinetics constants and the rates of substrate consumption and PHA accumulation as well as PHA yield coefficient and volumetric productivity .

Social competence

K1 - Students will gain experience in working as an active member of a team.
K2 - They will gain an understanding of the importance of biopolymers production in protection of the environment and for industry.

BASIC LITERATURE

1) Doi Y., Steinbüchel A. (Eds.), Biopolymers, Volume 3a , Polyesters I – Biological Systems and Biotechnologal Production, wyd. Wiley-Blackwell, 2002 ; 2) Doi Y., Steinbüchel A. (Eds.)., Biopolymers, Volume 3b , Polyesters II - Properties and Chemical Synthesis, wyd. Wiley-Blackwell, 2002 ; 3) Doi Y., Steinbüchel A. (Eds.)., Biopolymers, Volume 4 , Polyesters III – Applications and Comercial products., wyd. Wiley-Blackwell, 2002 ; 4) Ebnesajjad S. (Ed.), Handbook of Biopolymers and Biodegradable Plastics: Properties, Processing and Applications., wyd. William Andrew, 2012 ; 5) Mittal V. (Ed.)., Renewable Polymers: Synthesis, Processing, and Technology, wyd. Wiley-Scrivener, 2011 ; 6) Volova T. G, Polyhydroxyalkanoates –Plastic Materials of the 21st Century: Production, Properties, and Application. , wyd. Nova Science Publishers, Inc, 2011

SUPPLEMENTARY LITERATURE

1) Steinbüchel A., Doi Y. (Eds.), Biotechnology of Biopolymers. From Synthesis to Patents. , wyd. Wiley-Blackwell, 2005 ; 2) Serafim, L.S., Lemos, P.C., Albuquerque, M.G.E., Reis, M.A.M., Strategies for PHA production by mixed cultures and renewable waste materials. , wyd. Applied Microbiology and Biotechnology, 2008, t. 81 (4), s. 615-628; 3) Chen G.Q., Plastics from Bacteria. Natural Functions and Applications. , wyd. Springer-Verlag, Berlin Heidelberg, Germany, 2010

Course / module
Technologies of Biopolymer Production

Fields of education:
Obszar nauk technicznych

Course status:	facultative
Course group:	C - przedmioty specjalnościowe
ECTS code:	06949-20-C
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	2 / 3

Type of course:
Laboratory classes, Lecture

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

Teaching forms and methods
Laboratory classes(K1, U1, U2) : , Lecture(K2, W1) :

Form and terms of the verification results:
LABORATORY CLASSES: Write-up - null(K1, U1, U2) ;LECTURE: Colloquium test - null(K2, 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. Tomasz Pokój,

Course coordinators:

Notes:

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Detailed description of the awarded ECTS points - part B

06949-20-C TECHNOLOGIES OF BIOPOLYMER PRODUCTION

ECTS:3
YEAR: 2019Z

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	2 h
	47 h

2. Student's independent work:

-	25 h
-	5 h
-	13 h
	43 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 90 h : 25 h/ECTS = 3,60 ECTS
average: **3 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 1,88 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 1,12 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

06049-20-C
ECTS: 3
YEAR: 2019Z

TECHNOLOGY OF AEROBIC GRANULAR SLUDGE
TECHNOLOGY OF AEROBIC GRANULAR SLUDGE

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_U03+, T2A_U04+, T2A_U06+, T2A_U08+, T2A_W01+, T2A_W02+,
Codes of learning outcomes in a major area of study:	K2_K01+, K2_K03+, K2_U04+, K2_U06+, K2_W02+, K2_W06+,

LEARNING OUTCOMES:

Knowledge

W1 - Recognizes the relationships between technological parameters of wastewater treatment and the morphology and activity of aerobic granules. Knows how to calculate operational parameters and the efficiency of wastewater treatment in aerobic granular sludge systems
W2 - Characterizes the composition of extracellular polymers and defines their role in the formation of aerobic granular sludge

Skills

U1 - Knows how to characterize morphology, EPS content and activity of aerobic granules. Designs operational parameters of one-stage aerobic granular sludge systems, determines the effectiveness of treatment and morphology of aerobic granules. Can write a report from the conducted experiments

Social competence

K1 - Is aware of the importance of technologies to prevent environmental degradation. Is able to work in the team
K2 - Is aware of the need for learning throughout life

BASIC LITERATURE

1) different authors, Materials and laboratory protocols given by a teacher, wyd. author's script, 2018 ; 2) different authors, Scientific publications in the field, wyd. various publications, 2018

SUPPLEMENTARY LITERATURE

Course / module
Technology of aerobic granular sludge

Fields of education:
Obszar nauk technicznych

Course status:	facultative
Course group:	C - przedmioty specjalnościowe
ECTS code:	06049-20-C
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	2 / 3

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

Form and terms of the verification results:
LABORATORY CLASSES: Report - null(K1, U1, W1, W2) ;LECTURE: Written test - null(K1, K2, U1, W1, W2) ;PROJECT CLASSES: Report - null(K1, U1, W1, W2)

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. Agnieszka Cydzik-Kwiatkowska,

Course coordinators:

Notes:
up to 18 students per group

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Detailed description of the awarded ECTS points - part B

06049-20-C
ECTS:3
YEAR: 2019Z

TECHNOLOGY OF AEROBIC GRANULAR SLUDGE
TECHNOLOGY OF AEROBIC GRANULAR SLUDGE

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	2 h
	47 h

2. Student's independent work:

-	43 h
	43 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 90 h : 25 h/ECTS = 3,60 ECTS
average: **3 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 1,88 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 1,12 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

06049-20-C
ECTS: 3
YEAR: 2019L

ALGAE BIOMASS - SOURCES AND METHODS OF APPLICATION
ALGAE BIOMASS - SOURCES AND METHODS OF APPLICATION

COURSE CONTENT
CLASSES:

The calculation of the efficiency of the chosen methods of obtaining biomass from natural sources. The calculation of the efficiency of the algae biomas production in open systems. The calculation of the efficiency of the algae biomas production in foto-bioreactors. The calculation of the biogas production using algal biomass. The calculation of oli production using algal biomass. The calculation of protein production using algal biomass.

LECTURES:

Charisteria of algae biomass. Natural source of algae biomass. Methods of algae biomass cultivation. Algae as a source of biomass for the methane fermentation process. Algae as a source of liquid fuels. Burning and pyrolysis of algae biomass. Algae as a source of proteins.

EDUCATIONAL OBJECTIVE:

The aim of education is to familiarize with the following topics; Characteristics of algae biomass. Natural source of algae biomass. Methods of algae biomass cultivation. Algae as a source of biomass for the methane fermentation process. Algae as a source of liquid fuels. Burning and pyrolysis of algae biomass. Algae as a source of proteins.

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_U04+, T2A_U08+, T2A_W01+, T2A_W02+,
Codes of learning outcomes in a major area of study:	K2_K01+, K2_K03+, K2_U04+, K2_U06+, K2_W02+, K2_W06+,

LEARNING OUTCOMES:

Knowledge

W1 - Student lists sources of algae biomass.
W2 - Student knows methods of algae biomass using. Student knows potential of algae biomass

Skills

U1 - Students can calculate potential of biomass production in different systemss.
U2 - Students can calculate potential of acquisition algae from natural sources. Students can calculate energy production from algae biomass in different process (biogass, oli, burning

Social competence

K1 - The student is aware of the need for self-education. The student understands the rules for the use of natural resources

BASIC LITERATURE

1) DĘBOWSKI M., ZIELIŃSKI M., GRALA A., DUDEK M., , Algae biomass as an alternative substrate in biogas production technologies – review,, wyd. Renewable and Sustainable Energy Reviews 27, 2013 , s. 596-604; 2) Bux Faizal , Algae Biotechnology, wyd. Springer International Publishing AG, 2015

SUPPLEMENTARY LITERATURE

1) Ashok Pandey, Duu-Jong Lee, Yusuf Chisti and Carlos R Soccol , Biofuels from Algae , wyd. Elsevier B.V, 2014 ; 2) Carl J. Soeder , Gedaliah Shelef , Algae Biomass: Production and Use, wyd. Elsevier Science Ltd, 1980

Course / module
Algae biomass - sources and methods of application

Fields of education:
Obszar nauk technicznych

Course status:	facultative
Course group:	C - przedmioty specjalnościowe
ECTS code:	06049-20-C
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	2 / 3

Type of course:
Lecture, Project classes

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

Teaching forms and methods
Lecture(K1, W1, W2) : lectures: information lecture , Project classes(U1, U2) : project classes

Form and terms of the verification results:
LECTURE: Exam - null(K1, W1, W2) ;PROJECT CLASSES: Colloquium test - null(U1, U2)

Number of ECTS points:	3
Language of instruction	polski

Introductory courses:
-

Preliminary requirements:
: basics knowlegde from renewable energy

Name of the organizational unit offering the course:
Katedra Inżynierii Środowiska,

Person in charge of the course:
dr hab. inż. Marcin Dębowski, prof. UWM

Course coordinators:

Notes:
-

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Detailed description of the awarded ECTS points - part B

06049-20-C
ECTS:3
YEAR: 2019L

ALGAE BIOMASS - SOURCES AND METHODS OF APPLICATION

ALGAE BIOMASS - SOURCES AND METHODS OF APPLICATION

The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

- participation in: project classes	30 h
- participation in: lecture	15 h
- consultation	2 h
	47 h

2. Student's independent work:

- preparing for classes	18 h
- preparing for tests	5 h
- preparing to exam	5 h
	28 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 75 h : 25 h/ECTS = 3,00 ECTS

average: **3 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 1,88 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 1,12 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

06049-20-C
ECTS: 3
YEAR: 2019L

BIOMARKERS OF ENVIRONMENTAL CONTAMINATION
BIOMARKERS OF ENVIRONMENTAL CONTAMINATION

COURSE CONTENT
CLASSES:

Presentation of Health and Safety regulations. Good laboratory practice. Training pippetting micro volumes of liquids with different physical properties, i.e. density, viscosity. Preparation of the short-term waterborne exposure of zebrafish (Danio rerio) embryos to a suit of model toxic compounds. Evaluation of anatomical malformations and physiological abnormalities in the exposed zebrafish larvae. Isolation of total RNA using modified Chomczynski method. Spectrophotometric measurement of quantity and purity of the isolated RNA samples. Elimination of genomic DNA from the samples.Assessment of RNA integrity. Reverse transcription. Analysis of gene expression using real-time quantitative PCR (qPCR). Calculations of raw values obtained from qPCR and their statistical analysis. Seminar on the molecular mechanisms of action of selected groups of environmental contaminant. Presentation of the laboratory results. Genotoxicity assessment of the selected model compounds. Analysis of microscope slides images obtained by micronucleus test and comet assay.

LECTURES:

Definition and classification of biomarkers. Specificity of biomarkers. Relationship between effect and biomarker's response. Plant's response to environmental stress. Behavioral changes of animals. Anatomical and physiological endpoints of environmental pollutants. Mutagenicity, genotoxicity, and cancerogenicity of environmental contaminants. Polycyclic aromatic hydrocarbons. Toxic metals metabolism. Oxidative stress. Endocrine Discrupting Compounds. Environmental estrogens and androgens, and their molecular mechanisms of action. Pharmaceuticals and their residues in aquatic environment. Nanoparticles – threat or chance? Biomarkers at the molecular level. Micro RNAs as an emerging tool in prognostic studies. The role of biomarkers in environmental risk assessment. The use of biomarkers in environmental monitoring.

EDUCATIONAL OBJECTIVE:

The student gains knowledge about biomarkers of environmental contamination

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_U03+, T2A_U04+, T2A_U06+, T2A_U08+, T2A_W01+, T2A_W02+,
Codes of learning outcomes in a major area of study:	K2_K01+, K2_K03+, K2_U04+, K2_U06+, K2_W02+, K2_W06+,

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) 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. Bios Scientific Publishers, wyd. Oxford, 2000

SUPPLEMENTARY LITERATURE

Course / module
Biomarkers of environmental contamination

Fields of education:
Obszar nauk technicznych

Course status:	facultative
Course group:	C - przedmioty specjalnościowe
ECTS code:	06049-20-C
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	2 / 3

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) : condunting experiment, Lecture(W1, W2) : information lecture (multimedia presentation, problem lecture, conversation)

Form and terms of the verification results:
LABORATORY CLASSES: Report - grade for laboratory report with presentation (K1, K2, U1, W1, W2) ;LECTURE: Colloquium test - test(W1, W2)

Number of ECTS points:	3
Language of instruction	angielski

Introductory courses:
biology, chemistry, toxic chemical risk

Preliminary requirements:
basic knowledge of molecular genetics, good pippetting skills

Name of the organizational unit offering the course:
Katedra Biotechnologii w Ochronie Środowiska,

Person in charge of the course:
dr inż. Maciej Woźny,

Course coordinators:

Notes:
Laboratory classes conducted for small groups (max. 12 students)

ECTS code: AAABB-CD-E_F

AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Detailed description of the awarded ECTS points - part B

06049-20-C
ECTS:3
YEAR: 2019L

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

2. Student's independent work:

- preparation for laboratory classes	15 h
- prepare to complete the course	10 h
- preparing a presentation	5 h
- preparing a report	13 h
	43 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 90 h : 25 h/ECTS = 3,60 ECTS
average: **3 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 1,88 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 1,12 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

BIOPROCESS ENGINEERING
BIOPROCESS ENGINEERING

06049-20-C
ECTS: 2
YEAR: 2019L

COURSE CONTENT
CLASSES:

Kinetics of simple chemical reactions used in biochemical engineering. Determination of the rate constants and reaction rates in processes during wastewater treatments. The kinetics of microbial growth-Monod equation. Determination of rate constants of microbial growth. Sludge production in activated sludge systems. Material balances. Technological concepts of organic compounds removal and nitrification in activated sludge systems based on the kinetic constants. Kinetics of adsorption process. Determination of the constants in the Langmuir and Freundlich models.

LECTURES:

non e

EDUCATIONAL OBJECTIVE:

Transfer of knowledge about the kinetics of individual processes taking place in waste water treatment systems

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_U06++, T2A_U19+, T2A_W06+,
Codes of learning outcomes in a major area of study:	K2_K03+, K2_U04+, K2_U14+, K2_U16+, K2_W10+,

LEARNING OUTCOMES:

Knowledge

W1 - Students know the criteria for dividing reactors for wastewater treatment due to the type of of the process (continuous, semi-continuous). Students have knowledge about biomass yield in wastewater treatment systems.

Skills

U1 - Students can determine the kinetic constants, calculate the rate of pollutants removal from wastewater and draw up material balances for different types of reactors. He can determine kinetics constants of biomass production in wastewater systems. On the basis of kinetic constants, student know how to design unit processes during wastewater treatment.

Social competence

K1 - Students are aware of the progress in the development and application of new types of reactors

BASIC LITERATURE

1) Shuler M. L., Kargi F. , Bioprocess engineering. Basic concepts, wyd. Pretince Hall PTR, 2002

SUPPLEMENTARY LITERATURE

1) Berovic M., Nienow A. W., Biochemical engineering principles, wyd. Published by Faculty of Chemistry and Chemical Technology, University of Ljubljana, Slovenia, 2006

Course / module
Bioprocess engineering

Fields of education:
Obszar nauk technicznych

Course status:	mandatory
Course group:	C - przedmioty specjalnościowe
ECTS code:	06049-20-C
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	2 / 3

Type of course:
Auditorium classes, Computer classes

Number of hours per semester/week:	Auditorium classes: 15, Computer classes: 15

Teaching forms and methods
Auditorium classes(K1, U1, W1) : project, Computer classes(K1, U1, W1) : calculations using Microsoft Excel

Form and terms of the verification results:
AUDITORIUM CLASSES: Project - preparing the project(K1, U1, W1) ;COMPUTER CLASSES: Colloquium practical - performance of the tasks envisaged in the program(K1, U1, W1)

Number of ECTS points:	2
Language of instruction	polski

Introductory courses:
biochemistry, environmental microbiology, sewage treatment technologies

Preliminary requirements:
Knowledge of waste water treatment technologies

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:

Notes:
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ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Detailed description of the awarded ECTS points - part B

06049-20-C
ECTS:2
YEAR: 2019L

BIOPROCESS ENGINEERING
BIOPROCESS ENGINEERING

The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

- participation in: auditorium classes	15 h
- participation in: computer classes	15 h
- consultation	2 h
	32 h

2. Student's independent work:

- preparation for colloquia	23 h
- preparation for tests	20 h
	43 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 75 h : 25 h/ECTS = 3,00 ECTS
average: **2 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 1,28 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 0,72 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

06049-20-C
ECTS: 3
YEAR: 2019L

DESIGNING BIOWASTE TREATMENT PROCESSES
DESIGNING BIOWASTE TREATMENT PROCESSES

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_K02+, T2A_K03+, T2A_K04+, T2A_K06+, T2A_U09+, T2A_W01+,
Codes of learning outcomes in a major area of study:	K2_K01+, K2_U09+, K2_W01+,

LEARNING OUTCOMES:

Knowledge

W1 - At the end of the course, Students should have knowledge on optimization of the process of biological treatment of biodegradable waste, including parameters such as availability of nutrients, moisture, temperature, aeration intensity in aerobic processes, as well as the knowledge on the modeling of the conditions occurring in an energetic pile. Students should know the basics of the software tools for designing processes

Skills

U1 - Students, while attending classes, should acquire skills to develop technological processes of biological treatment of municpal solid waste, sewage sludge under aerobic and anaerobic conditions. They should also be able to use advanced programming tools to develop a three-dimensional model of a reactor for biological treatment of waste

Social competence

K1 - The program has been prepared to provide students competencies to work in the waste biotreatment industry, such as composting plants, landfills, waste bio-drying plants, sewage treatment plants. Students have to possess basic knowledge for the effective and safe operation of the energetic pile, the management of the biological processes yielding biogas and production of high quality compost

BASIC LITERATURE

1) Evans G.,, Biowaste and Biological Waste Treatment, wyd. Earthscan, 2001 ; 2) Hansen J. A.,, Management of Urban Biodegradable Wastes: Collection, Occupational Health, Biological Treatment, Product Quality Criteria and End User Demand., wyd. Eartscan. , 1996 ; 3) Mata Alvarez J., , Biomethanization of the Organic Fraction of Municipal Solid Wastes., wyd. IWA Publishing, 2003 ; 4) Jördening, H.-J., Winter J., , Environmental Biotechnology: Concepts and Applications., wyd. John Wiley & Sons, 2005 ; 5) Nayono S. E., , Anaerobic Digestion of Organic Solid Waste for Energy Production, wyd. KIT Scientific Publishing, 2009

SUPPLEMENTARY LITERATURE

Course / module
Designing biowaste treatment processes

Fields of education:
Obszar nauk technicznych

Course status:	facultative
Course group:	C - przedmioty specjalnościowe
ECTS code:	06049-20-C
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	2 / 3

Type of course:
Lecture, Project classes

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

Teaching forms and methods
Lecture(K1, W1) : , Project classes(U1) :

Form and terms of the verification results:
LECTURE: Colloquium test - null(K1, W1) ;PROJECT CLASSES: Written test - null(U1)

Number of ECTS points:	3
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 inż. Sławomir Kasiński,

Course coordinators:

Notes:
Required to have a calculator by every student and a laptop (if possible) by every second student

Detailed description of the awarded ECTS points - part B

06049-20-C
ECTS:3
YEAR: 2019L

DESIGNING BIOWASTE TREATMENT PROCESSES
DESIGNING BIOWASTE TREATMENT PROCESSES

The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

- participation in: project classes	30 h
- participation in: lecture	15 h
- consultation	2 h
	47 h

2. Student's independent work:

-	10 h
-	8 h
-	10 h
	28 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 75 h : 25 h/ECTS = 3,00 ECTS
average: **3 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 1,88 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 1,12 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

06949-20-C
ECTS: 3
YEAR: 2019L

DESIGNING OF AGRICULTURE BIOGAS PLANTS
DESIGNING OF AGRICULTURE BIOGAS PLANTS

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_K07+, T2A_U19+, T2A_W07+,
Codes of learning outcomes in a major area of study:	K2_K02+, K2_U15+, K2_W12+,

LEARNING OUTCOMES:

Knowledge

W1 - A student will have knowledge of biochemical fundaments of anaerobic digestion. He will decribe parameters which influence on the efficiency of a biogas production. They will describe methods of heating and mixing of a digester chamber. He will have knowledge of manners of digestate post-treatment. He will describe methods of biogas cleaning and utilization.

Skills

U1 - Students will be able to estimate a biogas yield for substrates and co-substrates. They will be able to determine a substrate requirement for a biogas plant with defined rating. They will be able to calculate operational parameters for a digestion chmber. They will be able to prepare a technological concept of an agricultural biogas plant with a different electric power.

Social competence

K1 - A student will understand the importance of a devoplment of methods of a biogas production from waste and by-products.

BASIC LITERATURE

1) Deublein D., Steinhauser A. , Biogas from Waste and Renewable Resources, wyd. Wiley-VCH verlag GmgH & Co. KGaA, Weinheim, 2011 ; 2) Wellinger A., Murphy J., Baxter D. (Eds.), The Biogas Handbook: Science, Production And Applications. 1st Ed., wyd. Woodhead Publishing, 2013 ; 3) Abbasi T., Tauseef S.M., Abbasi S.A., Biogas Energy. , wyd. Springer, 2011 ; 4) Mudhoo A. (Ed.), Biogas Production: Pretreatment Methods in Anaerobic Digestion. 1 st Ed. , wyd. Wiley-Scrivener, 2012

SUPPLEMENTARY LITERATURE

1) Chen Y., Cheng J.J., Creamer K.S., Inhibition of anaerobic digestion process: A review. Bioresource Technol., wyd. Bioresource Technology, 2008, t. 99(10), s. 4044-4064; 2) Kayhanian M., Tchobanoglous G. , Energy Recovery by Anaerobic Digestion. In: Kreith F., Goswami D.Y. (Edts.), Handbook of Energy Efficiency and Renewable Energy. , wyd. CRC Press Taylor & Francis Group, Boca Raton, USA., 2007

Course / module

Designing of agriculture biogas plants

Fields of education:

Obszar nauk technicznych

Course status:	facultative
Course group:	C - przedmioty specjalnościowe
ECTS code:	06949-20-C
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	2 / 3

Type of course:

Lecture, Auditorium classes

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

Teaching forms and methods

Lecture(K1, W1) : , Auditorium classes(U1) :

Form and terms of the verification results:

LECTURE: Colloquium test - null(K1, U1, W1) ;AUDITORIUM CLASSES: Colloquium test - null(K1, U1, 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. Tomasz Pokój,

Course coordinators:

Notes:

ECTS code: AAABB-CD-E_F

AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Detailed description of the awarded ECTS points - part B

06949-20-C
ECTS:3
YEAR: 2019L

DESIGNING OF AGRICULTURE BIOGAS PLANTS
DESIGNING OF AGRICULTURE BIOGAS PLANTS

The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

- participation in: auditorium classes	30 h
- participation in: lecture	15 h
- consultation	2 h
	47 h

2. Student's independent work:

-	13 h
-	10 h
-	20 h
	43 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 90 h : 25 h/ECTS = 3,60 ECTS
average: **3 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 1,88 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 1,12 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

06049-24-C
ECTS: 3
YEAR: 2019L

INFORMATIVE TECHNIQUES IN ENVIRONMENTAL BIOTECHNOLOGY
INFORMATIVE TECHNIQUES IN ENVIRONMENTAL 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_U01+, T2A_U03++, T2A_U04++, T2A_U06+, T2A_U10+, T2A_W01+, T2A_W05+,
Codes of learning outcomes in a major area of study:	K2_K03+, K2_U01+, K2_U03+, K2_U04+, K2_W01+, K2_W17+,

LEARNING OUTCOMES:

Knowledge

W1 - The student will know how useful in current biotechnology and molecular genetic are bioinformatics techniques
W2 - The student will know how important are using them in various areas of molecular genetic. The student will know what are the contributions of using a bioinformatics tools in conservation genetic or other fields of biological sciences

Skills

U1 - The student can find and design a set or sets of primers for amplify a DNA fragments by using PCR technique. The student can read and evaluate the results of sequencing, SNP analysis. The student can convert a type of input file between various computer tools applied in molecular genetic. The student can calculate and evaluate a indicators of genetic variation by using various software. The student can asses a genetic distance between populations and can construct the phylogenetic tree and evaluate a phylogenetic distance
U2 - The student can prepare the genetic profiles of individuals that are intended to be berrd and identify a set optimal pairs among them. The student can measure the length of DNA fragments by using automatic capillary sequencer and software. The student can asses the results of genetic variation analysis

Social competence

K1 - The student will be able to propose a appropriate set of molecular analysis to reach the objectives of conservation programs. The student will be able to decide if conservation programs are effective or not. The student will be able to evaluate genetic similarity between populations and propose a optimal conservation strategy. The student will be able to optimize and adopt a various molecular and bioinformatics techniques to increase efficiency and decrease a costs of conservation programs

BASIC LITERATURE

1) Dieringer D., Schlötterer C. , Microsatellite analyzer (MSA): a platform independent analysis tool for large microsatellite data sets. , wyd. Molecular Ecology Notes, 2003, t. 3, s. 167-169; 2) Excoffier L., Laval G., Schneider S. , An integrated software package for population genetics data analysis, wyd. Evolutionary Bioinformatics Online, 2005, t. 1, s. 47-50; 3) Excoffier L., Smouse P., Quattro J. , Analysis of molecular variance inferred from metric distances among DNA haplotypes: Application to human mitochondrial DNA restriction data, wyd. Genetics, 1992, t. 131, s. 479-491; 4) Kaczmarczyk D., Kaczor A., New multiplex PCR assays for estimating genetic diversity in rainbow trout (Oncorhynchus mykiss) by polymorphism of microsatellite DNA, wyd. Environmental Biotechnology , 2009, t. 1, s. 19-24; 5) Schoske R., Vallone P. M., Ruitberg C. M., Butler J. M. , Multiplex PCR design strategy used for the simultaneous amplification of 10 Ychromosome short tandem repeat (STR) loci. , wyd. Analytical and Bioanalytical Chemistry, , 2003, t. 375, s. 333-343

SUPPLEMENTARY LITERATURE

1) Guo S.W., Thompson E.A. , Performing the exact test of Hardy-Weinberg proportion for multiple alleles., wyd. Biometrics, 1992, t. 48, s. 361–372; 2) Goldstein D.B., Ruiz Linares A., Cavalli-Sforza L.L, Feldman M.W. , An evaluation of genetic distances for use with microsatellite loci. , wyd. Genetics, 1993, t. 139, s. 463-471; 3) Ramaswamy, S.V., , Single Nucleotide Polymorphisms in Genes Associated with Isoniazid Resistance in Mycobacterium tuberculosisn antimicrob, wyd. Agents Chemother, 2003, t. 47, s. 1241-1250

Course / module
Informative techniques in environmental biotechnology

Fields of education:
Obszar nauk technicznych

Course status:	facultative
Course group:	C - przedmioty specjalnościowe
ECTS code:	06049-24-C
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	2 / 3

Type of course:
Lecture, Computer classes

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

Teaching forms and methods
Lecture(K1, W1, W2) : , Computer classes(U1, U2) :

Form and terms of the verification results:
LECTURE: Colloquium test - null(K1, U1, U2, W1, W2) ;COMPUTER CLASSES: Colloquium test - null(K1, U1, U2, W1, W2)

Number of ECTS points:	3
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 inż. Dariusz Kaczmarczyk,

Course coordinators:

Notes:
The classes should be performed in small groups

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Detailed description of the awarded ECTS points - part B

06049-24-C
ECTS:3
YEAR: 2019L

INFORMATIVE TECHNIQUES IN ENVIRONMENTAL BIOTECHNOLOGY

INFORMATIVE TECHNIQUES IN ENVIRONMENTAL BIOTECHNOLOGY

The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

- participation in: computer classes	30 h
- participation in: lecture	15 h
- consultation	2 h
	47 h

2. Student's independent work:

-	9 h
-	9 h
	18 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 65 h : 25 h/ECTS = 2,60 ECTS
average: **3 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 1,88 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 1,12 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

01049-20-C
ECTS: 3
YEAR: 2019L

INTRODUCTION TO NANOBIOTECHNOLOGY
INTRODUCTION TO NANOBIOTECHNOLOGY

COURSE CONTENT
CLASSES:

Bioreduction. Biosynthesis of nanoparticles (nanosilver or nanogold particles). Properties of nanoparticles. Antimicrobial properties of nanosilver. Application of nanoparticles. Immobilization of enzymes on nanoparticles. Analysis of nanobiocatalyst properties. Synthesis of biodiesel with nanobiocatalyst. Valorization of whey permeate. Biosynthesis of galactooligosaccharides. Utilization of atomic force microscopy (ATM) for nanoparticle characterization. Application of different techniques of analysis. Micelles, microemulsions and nanoemulsions preparation. Liposomes preparation.

LECTURES:

The objective of the course is to endow an overview of the fundamental concepts of modern nanobiotechnology and to discuss the risks and benefits of its application in the areas of health, food agriculture and forensic science. Emphasis will be placed on the melding of nanofabrication and biosystems and the current and future trends of nanobiotechnology. The possible effects that the use of nanotechnological materials and devices will have on the environment will be presented.

EDUCATIONAL OBJECTIVE:

The aim of the course is to introduce the fundamental concepts of nanotechnology to the students.

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_U03+, T2A_U04+, T2A_U08++, T2A_W01++, T2A_W02++,
Codes of learning outcomes in a major area of study:	K2_K01++, K2_K03++, K2_U04+, K2_U06++, K2_W02++, K2_W06++,

LEARNING OUTCOMES:

Knowledge

W1 - The studens will gain sufficient of nanoscience and nanotechology-related vocabulary to enable effective communication with practitioners in a diverse range of literate fields, including materials science and engineering, biomaterials engineering
W2 - Acquire a general knowledge to synthesize nanomaterials and understand their nanoscale properties
W3 - Acquire insight into how macroscopic properties can be changed via nanoscale engineering and molecular level manipulation
W4 - Acquire fundamental knowledge of nanotechnology principles and applications

Skills

U1 - Be able to critically evaluate nanotechnology concepts and therefore be equipped to delve deeper into nanotechnology research
U2 - Acquire knowledge of basic approaches to synthesize inorganic colloidal nanoparticles
U3 - - Demonstrate understanding techniques of microscopy for investigations on the nanometre and atomic scales

Social competence

K1 - Understand the influence of nanobiotechnology on materials properties and environment
K2 - Understand the physical and chemical properties of carbon nanotubes and nanostructured materials
K3 - Apply ethical principles and legislation to the area of nanoscience and nanotechnology

BASIC LITERATURE

1) Niemeyer C.M., Mirkin C.A., Nanobiotechnology: Concepts, Applications and Perspectives, wyd. Wiley-VCH, 2004 ; 2) Mirkin C.A., Niemeyer C.M., Nanobiotechnology - II more concepts and applications, wyd. Wiley-VCH, 2007 ; 3) Goodsell S.D., Bionanotechnology, Lessons from Nature, wyd. Wiley-Liss Inc., 2004 ; 4) Shoseyov O., Levy I., Nanobiotechnology-BioInspired Devices and Materials of the Future, wyd. Humana Press Inc., 2008 ; 5) Reisner D.E., Bionanotechnology- Global Prospects, wyd. Taylor & Francis Group LLC, 2009 ; 6) Koch C.C., Nanostructured Materials: Processing, Properties and Potential Applications, wyd. Noves Publications, 2002

SUPPLEMENTARY LITERATURE

1) Freitas Jr. R.A., Nanomedicine, Volume I: Basic Capabilities, wyd. Landes Bioscience, 1999 ; 2) Yao N., Wang Z.L., Handbook Of Microscopy For Nanotechnology, wyd. Kluwer Academic Publishers, 2005

Course / module
Introduction to nanobiotechnology

Fields of education:
Obszar nauk technicznych

Course status:	facultative
Course group:	C - przedmioty specjalnościowe
ECTS code:	01049-20-C
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	2 / 3

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) : 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	polski

Introductory courses:
biochemistry, chemistry, enzymology

Preliminary requirements:
biochemistry, chemistry, process engineering

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:

Notes:

ECTS code: AAABB-CD-E_F

AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Detailed description of the awarded ECTS points - part B

01049-20-C
ECTS:3
YEAR: 2019L

INTRODUCTION TO NANOBIOTECHNOLOGY
INTRODUCTION TO NANOBIOTECHNOLOGY

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	2 h
	47 h

2. Student's independent work:

- prepare for classes	13 h
- prepare for tests	20 h
- prepare reports from experiments	10 h
	43 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 90 h : 25 h/ECTS = 3,60 ECTS
average: **3 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 1,88 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 1,12 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

06049-20-C
ECTS: 5
YEAR: 2019L

MA SEMINARY
MA SEMINARY

COURSE CONTENT
CLASSES:

Water. Thermal Stratification. Bodies of Water. Rivers. Chemistry and the Study of Matter. Food Circulation. The States and Organisation of Matter. Letter of References. Common Carp. Classification of Matter. Professional Curriculum Vitae. Stickleback (plus letterhead). What is the Matter Made of? Letter of Recommendation (plus official letter). Tench. Atlantic Salmon. Lobelia Lakes. Inside the Atom. Sewage Treatment. Water Birds. Lakes (plus reprint request card). Northern Pike. Nuclear Genes and Chromosomes. Mitosis, Meiosis, Gametogenesis. Biotechnology in Aquaculture. Pre-Treatment of Municipal Solid Waste. Demonic Males. [Articles and one, a little/a few]. [Vocabulary]. Terms and conditions of examinatiof exercises. Students master the vocabulary (for each lecture is developed English-Polish dictionary with phonetic transcription). Each exercise is opened by written test knowledge of vocabulary. Each student prepares a few-minute presentation on any topic (PowerPoint) and speaks in English. Eager students prepare a few-minute presentation on a topic related to the subject of masters (preferably with master's thesis) (PowerPoint), and presented in English

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_K02+, T2A_K03+, T2A_K04+, T2A_K06+, T2A_U01+, T2A_U10+, T2A_W01+,
Codes of learning outcomes in a major area of study:	K2_K01+, K2_U01+, K2_W01+,

LEARNING OUTCOMES:

Knowledge

W1 - Presentation (oral and written) in English subjects related to the field of undergraduate and a more detailed presentation of issues related to the specialty of Master

Skills

U1 - Mastering (spoken and written) English-language vocabulary on the topic of the lectures

Social competence

K1 - Improving the practical use of research of scientific literature in learning the English language in scientific discussion and public presentation of prepared questions of a general nature (mandatory) and scientific (optional).

BASIC LITERATURE

1) Łuczyński M, , English for biotechnologists and hydrobiologists. Bilingual (in English with English-Polish dictionary for each topic, and the dictionary package) , wyd. materials for internal use at the Department of Biotechnology in Environmental Protection. Available, 2015-2016,

SUPPLEMENTARY LITERATURE

Course / module
MA Seminary

Fields of education:
Obszar nauk technicznych

Course status:	facultative
Course group:	C - przedmioty specjalnościowe
ECTS code:	06049-20-C
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	2 / 3

Type of course:
Auditorium classes

Number of hours per semester/week:	Auditorium classes: 75

Teaching forms and methods
Auditorium classes(K1, U1, W1) :

Form and terms of the verification results:
AUDITORIUM CLASSES: Prezentation - null(K1, U1) ;AUDITORIUM CLASSES: Colloquium test - null(K1, U1, W1)

Number of ECTS points:	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. inż. Irena Wojnowska-Baryła,

Course coordinators:

Notes:
brak

Detailed description of the awarded ECTS points - part B

06049-20-C
ECTS:5
YEAR: 2019L

MA SEMINARY
MA SEMINARY

The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

- participation in: auditorium classes	75 h
- consultation	2 h
	77 h

2. Student's independent work:

- preparation for defense of thesis	28 h
- preparing a presentation	20 h
	48 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 125 h : 25 h/ECTS = 5,00 ECTS
average: **5 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 3,08 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 1,92 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

06049-20-C
ECTS: 20
YEAR: 2019L

MASTER THESIS/PROFESSIONAL PRACTICE
MASTER THESIS/PROFESSIONAL PRACTICE

COURSE CONTENT
CLASSES:

Preparation of scientific work in this experiment, design, expertise, environmental impact assessment using the tools and methods used in environmental engineering

LECTURES:

The objectives of the course is introduction of rules scientific work using the tools and methods used in environmental biotechnology

EDUCATIONAL OBJECTIVE:

preparing to write a master thesis

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_K02+, T2A_K03+, T2A_K04+, T2A_K06+, T2A_U01+, T2A_U10+, T2A_W05+,
Codes of learning outcomes in a major area of study:	K2_K01+, K2_U01+, K2_W17+,

LEARNING OUTCOMES:

Knowledge

W1 - The student will be: familiar with the scientific publications in the field of research problem; know the rules of governed a scientific experiment; know methods to evaluate and interpret a results; know a methodology of scientific publication and presentation of results; know a rules of editorial scientific publication

Skills

U1 - The student be able to: read and understand the foreign-language literature; perform an experiment; collect and interpret the data from different sources; present and carry out a discussion; formulate conclusions; select keywords; write a summary.

Social competence

K1 - The student updates knowledge of research, cooperates with the research team and external entities.

BASIC LITERATURE

1) different authors, Scientific publication related to the topic of the thesis, wyd. industry and scientific journals, 2018

SUPPLEMENTARY LITERATURE

Course / module
Master Thesis/professional practice

Fields of education:
Obszar nauk technicznych

Course status:	facultative
Course group:	C - przedmioty specjalnościowe
ECTS code:	06049-20-C
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	2 / 3

Type of course:
Diploma course

Number of hours per semester/week:	Diploma course: 200

Teaching forms and methods
Diploma course(null) : discussion

Form and terms of the verification results:
DIPLOMA COURSE: Prezentation - the assumptions of the thesis(K1, U1, W1)

Number of ECTS points:	20
Language of instruction	angielski

Introductory courses:
none

Preliminary requirements:
advance knowledge in fields of environmental biotechnology

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:

Notes:
brak

ECTS code: AAABB-CD-E_F — AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Detailed description of the awarded ECTS points - part B

06049-20-C
ECTS:20
YEAR: 2019L

MASTER THESIS/PROFESSIONAL PRACTICE
MASTER THESIS/PROFESSIONAL PRACTICE

The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

- participation in: diploma course	200 h
- consultation	0 h
	200 h

2. Student's independent work:

-	100 h
-	50 h
-	200 h
	350 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 550 h : 25 h/ECTS = 22,00 ECTS
average: **20 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 8,00 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 12,00 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

MICRORGANISMS IN INDUSTRY
MICRORGANISMS IN INDUSTRY

06049-20-C
ECTS: 3
YEAR: 2019L

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_U03+, T2A_U04+, T2A_U06+, T2A_U08+, T2A_W01+, T2A_W02+,
Codes of learning outcomes in a major area of study:	K2_K03+, K2_U04+, K2_U06+, K2_W02+, K2_W06+,

LEARNING OUTCOMES:

Knowledge

W1 - Student should acquire knowledge concerning methods of industrial cultivation of microorganisms
W2 - Student will know methods of bioproducts extraction and purification

Skills

U1 - Student should acquire skills of bacterial cultivation and monitoring of bacterial growth
U2 - Student should acquire basic skills of fermentation products purification

Social competence

K1 - Student should acquire ability to prepare and present the aims and methods of biotechnological projects

BASIC LITERATURE

1) Glick B., Pasternak J.J., Author I., Molecular biotechnology : principles and applications of recombinant DNA, wyd. ASM Press, 2010 , s. 1020pp; 2) Mousdale, D.M.,, Biofuels : biotechnology, chemistry and sustainable development, wyd. Science, 2008 , s. 424; 3) Waites M. J., Morgan N. L., John S. Rockey J.S., Higton G., Industrial Microbiology: An Introduction, wyd. Wiley-Blackwell, , 2001 , s. 304pp

SUPPLEMENTARY LITERATURE

Course / module
Microrganisms in industry

Fields of education:
Obszar nauk technicznych

Course status:	facultative
Course group:	C - przedmioty specjalnościowe
ECTS code:	06049-20-C
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	2 / 3

Type of course:
Laboratory classes, Lecture

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

Teaching forms and methods
Laboratory classes(K1, U1, U2) : , Lecture(W1, W2) :

Form and terms of the verification results:
LABORATORY CLASSES: Report - null(K1, U1, U2) ;LABORATORY CLASSES: Colloquium test - null(W1, W2) ;LECTURE: Colloquium test - null(W1, W2)

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. Sławomir Ciesielski, prof. UWM

Course coordinators:

Notes:
brak

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Detailed description of the awarded ECTS points - part B

06049-20-C
ECTS:3
YEAR: 2019L

MICRORGANISMS IN INDUSTRY
MICRORGANISMS IN INDUSTRY

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	2 h
	47 h

2. Student's independent work:

-	10 h
-	13 h
-	10 h
-	10 h
	43 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 90 h : 25 h/ECTS = 3,60 ECTS
average: **3 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 1,88 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 1,12 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

13049-20-C
ECTS: 3
YEAR: 2019L

MODELING OF SELECTED BIOTECHNOLOGICAL PROCESSESS
MODELING OF SELECTED BIOTECHNOLOGICAL PROCESSESS

COURSE CONTENT
CLASSES:

Introduction to the models ASM and ADM. Fractionation of the particulate and soluble organic matter in wastewater and feedstocks. Kinetic coefficients of models. Acquaintance with modeling software. Evaluation of model usability to simulate processes in wastewater treatment plant and biogas plant.

LECTURES:

Design of wastewater treatment plant and biogas plant with simulation models. Characteristics of ASM and ADM simulation models. Distribution of organic matter in wastewaters and feedstocks. Structure of biochemical reactions and physico-chemical processes. Identification of parameters. Models implementation.

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_K04+, T2A_K06+, T2A_U03+, T2A_U06+, T2A_W01+, T2A_W02+,
Codes of learning outcomes in a major area of study:	K2_K01+, K2_K03+, K2_U04+, K2_W01+, K2_W06+,

LEARNING OUTCOMES:

Knowledge

W1 - Students will have knowledge about structure of model simulating of processes in wastewater treatment plant and biogas plant.

Skills

U1 - Students will prepare the matrix of components. Students will interpret the results of simulations, which can be used to predict the effects of wastewater treatment processes and biogas production

Social competence

K1 - Students are aware of the significance of modelling of biotechnological processes

BASIC LITERATURE

1) Henze M., Grady C.P.L., Gujer W., Marias G.v.R., Matsuo T., Activated Sludge Models ASM1, ASM2, ASM2d and ASM3, wyd. IWA Publishing, 2000 ; 2) Batstone D.J., Keller J., Angelidaki I., Kalyuzhnyi S.V., Pavlostathis S.G., Rozzi A., Sanders W.T.M, Anaerobic Digestion Model No. 1, wyd. IWA Publishing, 2002

SUPPLEMENTARY LITERATURE

1) Rieger L., Gillot S., Langergraber G., Ohtsuki T., Shaw A., Takacs I., Winkler S., Guidelines for Using Activated Sludge Models, wyd. IWA Publishing, 2012 ; 2) Henze M., Biological Wastewater Treatment: Principles, Modelling and Design, wyd. IWA Publishing, 2008

Course / module

Modeling of selected biotechnological processess

Fields of education:

Obszar nauk technicznych

Course status:	facultative
Course group:	C - przedmioty specjalnościowe
ECTS code:	13049-20-C
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	2 / 3

Type of course:

Lecture, Auditorium classes

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

Teaching forms and methods

Lecture(W1) : multimedia presentation, Auditorium classes(K1, U1) : Computer laboratory classes

Form and terms of the verification results:

LECTURE: Colloquium test - test(K1, U1, W1) ;AUDITORIUM CLASSES: Colloquium test - test(K1, U1, 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 inż. Katarzyna Bułkowska,

Course coordinators:

Notes:

brak

ECTS code: AAABB-CD-E_F

AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Detailed description of the awarded ECTS points - part B

13049-20-C
ECTS:3
YEAR: 2019L

MODELING OF SELECTED BIOTECHNOLOGICAL PROCESSESS
MODELING OF SELECTED BIOTECHNOLOGICAL PROCESSESS

The awarded number of ECTS points is composed of:

1. Contact hours with the academic teacher:

- participation in: auditorium classes	30 h
- participation in: lecture	15 h
- consultation	2 h
	47 h

2. Student's independent work:

- preparation to classes	23 h
- preparation to tests	20 h
	43 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 90 h : 25 h/ECTS = 3,60 ECTS
average: **3 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 1,88 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 1,12 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

06049-20-C
ECTS: 3
YEAR: 2019L

MOLECULAR DIAGNOSTICS
MOLECULAR DIAGNOSTICS

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_U08++, T2A_W01+, T2A_W02+,
Codes of learning outcomes in a major area of study:	K2_K01+, K2_K03+, K2_U06++, K2_W03+, K2_W06+,

LEARNING OUTCOMES:

Knowledge

W1 - The student will know what is genetic variation and why it is important for conservation of species
W2 - The student whill know what is microsatellite DNA and what information about genetic strusture of population can be read from polymorphism of those fragments of DNA. The student wil know what are PCR RFLP technigue, and measurement a fragments of DNA usung automatic DNA sequncer. The student will know what kinds of molecular tests can be used in detection of diseases and animals that enable a transfer of comertially important traits to future generations

Skills

U1 - The student will be able to apply a techniques of molecular genetic as a tool in detection of animal diseases and commercially important traits
U2 - The student can estimate a level of genetic variation within population and between populations. The student will interpretate a indicators of genetic variation, and detect the factors that might affect the level of genetic variability in conserved population. The student will be able to prepare a genetic profile of individuals and use them in conservation of species as well in commercial breedieng. The student will be able to asses interpopulation deiversity and propose the method to prevent it decrease

Social competence

K1 - The student will propose a appropirate strategy of conservation a species.The student wil be able to decide how to increase a possibility of succes in conservation of biodiversity and deduce a cost of those procedures
K2 - The student will be able to find a method of conservation of genetic wariation in the human dependant population as well in commercial stocks. The student will know how to use an genetic tests in detection of animal diseases or individuals that are an geneticaly valuable for breeding. The student will be able to asses a relationship between populations and propose apropirate technique to protec a genetic diversity of the species

BASIC LITERATURE

1) Levin B., Genes VIII, wyd. Pearson Prentice Hall, 2004 , s. 1003p; 2) Hartl D. E., Jones E. W. , Genetics: Principles and Analysis, wyd. Jones and Bartlett Publishers, 1998 , s. 1298p; 3) R. Levis., Human Genetics (Concepts and Applications) fifth edition Mc Graw-Hill Companies, wyd. Boston USA, 2003

SUPPLEMENTARY LITERATURE

1) Ellegren H., Microsatellite evolution: a battle between replication slippage and point mutations, wyd. Trends in Genetics, 2002, t. 18, s. 17

Course / module
Molecular Diagnostics

Fields of education:
Obszar nauk technicznych

Course status:	facultative
Course group:	C - przedmioty specjalnościowe
ECTS code:	06049-20-C
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	2 / 3

Type of course:
Laboratory classes, Lecture

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

Teaching forms and methods
Laboratory classes(U1, U2) : , Lecture(K1, K2, W1, W2) :

Form and terms of the verification results:
LABORATORY CLASSES: Colloquium test - null(K1, K2, U1, U2, W1, W2) ;LECTURE: Colloquium test - null(K1, K2, U1, U2, W1, W2)

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 inż. Dariusz Kaczmarczyk,

Course coordinators:

Notes:
The classes should be performed in small groups

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Detailed description of the awarded ECTS points - part B

06049-20-C
ECTS:3
YEAR: 2019L

MOLECULAR DIAGNOSTICS
MOLECULAR DIAGNOSTICS

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	2 h
	47 h

2. Student's independent work:

-	15 h
-	15 h
-	13 h
	43 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 90 h : 25 h/ECTS = 3,60 ECTS
average: **3 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 1,88 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 1,12 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

TECHNOLOGIES OF BIOPOLYMER PRODUCTION

06949-20-C
ECTS: 3
YEAR: 2019L

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_K03+, T2A_K07+, T2A_U02+, T2A_U12+, T2A_W07+,
Codes of learning outcomes in a major area of study:	K2_K01+, K2_K02+, K2_U02+, K2_U12+, K2_W12+,

LEARNING OUTCOMES:

Knowledge

W1 - Students will have knowledge of the application of technological strategies compatible with the concept of sustainable development for example production of biodegradable polymers as packaging materials. They will be able to describe properties and applications of polylactic acid, starch and polyhydroxyalkanoates. They will have knowledge of biochemical fundaments of PHAs synthesis using pure and mixed microbial cultures. They will be able to decribe fermentative production of short-chain-length and medium-chain-length PHAs and their copolymers.

Skills

U1 - Students will be able to perform bath culture of activated sludge for polyhydroxyalkanoates production. They will be able to analyse type and concentration of PHAs using gas chromatography method .
U2 - They will be able to determine kinetics constants and the rates of substrate consumption and PHA accumulation as well as PHA yield coefficient and volumetric productivity .

Social competence

K1 - Students will gain experience in working as an active member of a team.
K2 - They will gain an understanding of the importance of biopolymers production in protection of the environment and for industry.

BASIC LITERATURE

1) Doi Y., Steinbüchel A. (Eds.), Biopolymers, Volume 3a , Polyesters I – Biological Systems and Biotechnologal Production, wyd. Wiley-Blackwell, 2002 ; 2) Doi Y., Steinbüchel A. (Eds.)., Biopolymers, Volume 3b , Polyesters II - Properties and Chemical Synthesis, wyd. Wiley-Blackwell, 2002 ; 3) Doi Y., Steinbüchel A. (Eds.)., Biopolymers, Volume 4 , Polyesters III – Applications and Comercial products., wyd. Wiley-Blackwell, 2002 ; 4) Ebnesajjad S. (Ed.), Handbook of Biopolymers and Biodegradable Plastics: Properties, Processing and Applications., wyd. William Andrew, 2012 ; 5) Mittal V. (Ed.)., Renewable Polymers: Synthesis, Processing, and Technology, wyd. Wiley-Scrivener, 2011 ; 6) Volova T. G, Polyhydroxyalkanoates –Plastic Materials of the 21st Century: Production, Properties, and Application. , wyd. Nova Science Publishers, Inc, 2011

SUPPLEMENTARY LITERATURE

1) Steinbüchel A., Doi Y. (Eds.), Biotechnology of Biopolymers. From Synthesis to Patents. , wyd. Wiley-Blackwell, 2005 ; 2) Serafim, L.S., Lemos, P.C., Albuquerque, M.G.E., Reis, M.A.M., Strategies for PHA production by mixed cultures and renewable waste materials. , wyd. Applied Microbiology and Biotechnology, 2008, t. 81 (4), s. 615-628; 3) Chen G.Q., Plastics from Bacteria. Natural Functions and Applications. , wyd. Springer-Verlag, Berlin Heidelberg, Germany, 2010

Course / module
Technologies of Biopolymer Production

Fields of education:
Obszar nauk technicznych

Course status:	facultative
Course group:	C - przedmioty specjalnościowe
ECTS code:	06949-20-C
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	2 / 3

Type of course:
Laboratory classes, Lecture

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

Teaching forms and methods
Laboratory classes(K1, U1, U2) : , Lecture(K2, W1) :

Form and terms of the verification results:
LABORATORY CLASSES: Write-up - null(K1, U1, U2) ;LECTURE: Colloquium test - null(K2, 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. Tomasz Pokój,

Course coordinators:

Notes:

ECTS code: AAABB-CD-E_F

AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Detailed description of the awarded ECTS points - part B

06949-20-C
ECTS:3
YEAR: 2019L

TECHNOLOGIES OF BIOPOLYMER PRODUCTION

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	2 h
	47 h

2. Student's independent work:

-	25 h
-	5 h
-	13 h
	43 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 90 h : 25 h/ECTS = 3,60 ECTS
average: **3 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 1,88 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 1,12 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Wydział Nauk o Środowisku

Course / module syllabus - part A

06049-20-C
ECTS: 3
YEAR: 2019L

TECHNOLOGY OF AEROBIC GRANULAR SLUDGE
TECHNOLOGY OF AEROBIC GRANULAR SLUDGE

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_U03+, T2A_U04+, T2A_U06+, T2A_U08+, T2A_W01+, T2A_W02+,
Codes of learning outcomes in a major area of study:	K2_K01+, K2_K03+, K2_U04+, K2_U06+, K2_W02+, K2_W06+,

LEARNING OUTCOMES:

Knowledge

W1 - Recognizes the relationships between technological parameters of wastewater treatment and the morphology and activity of aerobic granules. Knows how to calculate operational parameters and the efficiency of wastewater treatment in aerobic granular sludge systems
W2 - Characterizes the composition of extracellular polymers and defines their role in the formation of aerobic granular sludge

Skills

U1 - Knows how to characterize morphology, EPS content and activity of aerobic granules. Designs operational parameters of one-stage aerobic granular sludge systems, determines the effectiveness of treatment and morphology of aerobic granules. Can write a report from the conducted experiments

Social competence

K1 - Is aware of the importance of technologies to prevent environmental degradation. Is able to work in the team
K2 - Is aware of the need for learning throughout life

BASIC LITERATURE

1) different authors, Materials and laboratory protocols given by a teacher, wyd. author's script, 2018 ; 2) different authors, Scientific publications in the field, wyd. various publications, 2018

SUPPLEMENTARY LITERATURE

Course / module
Technology of aerobic granular sludge

Fields of education:
Obszar nauk technicznych

Course status:	facultative
Course group:	C - przedmioty specjalnościowe
ECTS code:	06049-20-C
Field of study:	Environmental Engineering
Specialty area:	Environmental Biotechnology
Educational profile:	General academic
Form of study:	Stacjonarne
Level of study:	Drugiego stopnia
Year/Semester:	2 / 3

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

Form and terms of the verification results:
LABORATORY CLASSES: Report - null(K1, U1, W1, W2) ;LECTURE: Written test - null(K1, K2, U1, W1, W2) ;PROJECT CLASSES: Report - null(K1, U1, W1, W2)

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. Agnieszka Cydzik-Kwiatkowska,

Course coordinators:

Notes:
up to 18 students per group

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.

Detailed description of the awarded ECTS points - part B

06049-20-C
ECTS:3
YEAR: 2019L

TECHNOLOGY OF AEROBIC GRANULAR SLUDGE
TECHNOLOGY OF AEROBIC GRANULAR SLUDGE

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	2 h
	47 h

2. Student's independent work:

-	43 h
	43 h

1 ECTS point = 25-30 h. of the average student's work, number of ECTS points = 90 h : 25 h/ECTS = 3,60 ECTS
average: **3 ECTS**

- including the number of ECTS points for contact hours with direct participation of the academic teacher: 1,88 ECTS points,
- including the number of ECTS points for hours completed in the form of the student's independent work: 1,12 ECTS points,

ECTS code: AAABB-CD-E_F AAA - subject area code in the ECTS system, BB - major number, C - 1 first-cycle (engineer's degree or bachelor's degree)studies, 2 - second-cycle studies, 3 - uniform masters'degree studies, 4 - third-cycle studies, 5 - postgraduate studies, D -specialty number, E - course group, F - serial number of the course in the subset.