Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Faculty of Biotechnology and Animal Husbandry

Field of study	Biotechnology		
Mode of study	stacjonarna	*Level*	drugi
Graduate's qualification	magister inżynier		
Fields of study	dziedzina nauk ścisłych i przyrodniczych, dziedzina nauk rolniczych, dziedzina nauk inżynieryjno-technicznych		
Academic disciplines	nauki biologiczne (5%), technologia żywności i żywienia (10%), rolnictwo i ogrodnictwo (10%), inżynieria chemiczna (5%), inżynieria materiałowa (10%), zootechnika i rybactwo (60%)		
Educational profile	ogólnoakademicki		
Module			
Course unit	**English language**		
Code	BT_2A_S_20/21_BTA-A-07.1		
Field of specialisation			
Administering faculty	Studium Praktycznej Nauki Języków Obcych		
ECTS	3,0	*ECTS (forms)*	3,0
Form of course credit	zaliczenie	*Language*	angielski
Electives	7	*Elective group*	

Form of instruction	*Cod*	*Semester*	*Hours*	*ECTS*	*Weight*	*Credit*
laboratoria	L	1	30	3,0	1,00	zaliczenie

Leading teacher	Obstawski Andrzej (Andrzej.Obstawski@zut.edu.pl)
Other teachers	Bernat-Chmielarska Teresa (Teresa.Bernat-Chmielarska@zut.edu.pl), Kamińska Grażyna (Grazyna.Kaminska@zut.edu.pl), Karelus Dorota (Dorota.Karelus@zut.edu.pl), Sobczak Ewa (Ewa.Sobczak@zut.edu.pl)

Prerequisites	
W-1	Knowledge of a language at B2 level acknowledged by the final exam or a language certificate at the required level.

Module/course unit objectives	
C-1	Development of communicative and language competences for special purposes.
C-2	Ability of individual work with technical texts related to his/her major.

Course content divided into various forms of instruction		*Number of hours*
T-L-1	Specialist vocabulary and text concerning the following subjects : Living organisms Strategies and techniques of reading professional texts. Professional text structure	2
T-L-2	Reproduction in plants Sentece structure in professional texts. Passive and related forms	4
T-L-3	Heredity Complex sentences, conjuctions and conjunctive adverbs.	2
T-L-4	Photosynthesis Relative sentences	2
T-L-5	Nutrition	2
T-L-6	Health and disease Collocations and idioms in scientific papers	2
T-L-7	The circulatory system	2
T-L-8	Digestion in humans	2
T-L-9	Respiration	2
T-L-10	The excretory system	2
T-L-11	Locomotion	2
T-L-12	Temperature and heat transfer Presentation and evaluation of one's viewpoint conducted in the form of questions and discussion. Speculation on the advantages and disadvantages of the demonstrated solution.	2
T-L-13	Coordination in humans	2
T-L-14	Stem cells	2

Student workload - forms of activity	*Number of hours*

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Student workload - forms of activity		*Number of hours*
A-L-1	Practical classes	30
A-L-2	Preparation for classes	55
A-L-3	Individual tutorials	5

Teaching methods / tools	
M-1	Practical classes
M-2	Group work
M-3	Presentation
M-4	Discussion
M-5	Work with text
M-6	Listening comprehension

Evaluation methods (F - progressive, P - final)		
S-1	F	Presentation (F)
S-2	F	Written exam (S)

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6, 7 lub 8 PRK	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6 lub 7 umożliwiających uzyskanie kompetencji inżynierskich	Course objectives	Course content	Teaching methods	Evaluation methods
Knowledge							
BTap_2A_BTZ-A-07.1_W01 knows language structures used in specialist texts and selected specialist vocabulary for the programme of studies	BTap_2A_W01	P7S_WG		C-1	T-L-1 T-L-8 T-L-2 T-L-9 T-L-3 T-L-10 T-L-4 T-L-11 T-L-5 T-L-12 T-L-6 T-L-13 T-L-7 T-L-14	M-1 M-2 M-3 M-5	S-1 S-2
Skills							
BTap_2A_BTZ-A-07.1_U01 can speak on technical subjects related to his/her major	BTap_2A_U03	P7S_UK		C-1	T-L-1 T-L-8 T-L-2 T-L-9 T-L-3 T-L-10 T-L-4 T-L-11 T-L-5 T-L-12 T-L-6 T-L-13 T-L-7 T-L-14	M-1 M-2 M-3 M-4 M-6	S-1 S-2
BTap_2A_BTZ-A-07.1_U02 is able to understand texts and use basic specialist vocabulary in his/her field	BTap_2A_U03	P7S_UK		C-2	T-L-1 T-L-8 T-L-2 T-L-9 T-L-3 T-L-10 T-L-4 T-L-11 T-L-5 T-L-12 T-L-6 T-L-13 T-L-7 T-L-14	M-1 M-5	S-1 S-2
Social competences							
BTap_2A_BTZ-A-07.1_K01 is aware of the need of further education and self-improvement in developing language competences	BTap_2A_K01 BTap_2A_K07	P7S_KK P7S_KO P7S_KR		C-2	T-L-1 T-L-8 T-L-2 T-L-9 T-L-3 T-L-10 T-L-4 T-L-11 T-L-5 T-L-12 T-L-6 T-L-13 T-L-7 T-L-14	M-1 M-3	S-2

Outcomes	Grade	Evaluation criterion
Knowledge		
BTap_2A_BTZ-A-07.1_W01	*2,0*	
	3,0	Student has basic knowledge on language structures used in specialist texts.
	3,5	
	4,0	
	4,5	
	5,0	
Skills		
BTap_2A_BTZ-A-07.1_U01	*2,0*	
	3,0	Student can formulate short speeches on technical subjects.
	3,5	
	4,0	
	4,5	
	5,0	

Skills		
BTap_2A_BTZ-A-07.1_U02	*2,0*	
	3,0	Student understands at least 60% of specialist texts he/she reads.
	3,5	
	4,0	
	4,5	
	5,0	
Other social competences		
BTap_2A_BTZ-A-07.1_K01	*2,0*	
	3,0	Student is aware of the need of further education and self-improvement in his/her profession.
	3,5	
	4,0	
	4,5	
	5,0	

Required reading

1. N. Brieger, A. Pohl, TECHNICAL ENGLISH. VOCABULARY AND GRAMMAR, Summertown Publishing, 2002

2. K. Kelly, SCIENCE, Macmillan, 2004

3. John H. Postlethwait, Janet L. Hopson, Ruth C. Veres, Biology! BRINGING SCIENCE TO LIFE, McGraw-Hill, 1991

4. Brenda Walpole, Ashby Merson-Davies, Leighton Dann, BIOLOGY FOR THE IB DIPLOMA, Cambridge, 2011

5. Miracles locked in a living cell., The Sunday Times

Supplementary reading

1. M. Moo-Young, COMPREHENSIVE BIOTECHNOLOGY VOL. 1-6, ELSEVIER, 2011

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Field of study	Biotechnology		
Mode of study	stacjonarna	*Level*	drugi
Graduate's qualification	magister inżynier		
Fields of study	dziedzina nauk ścisłych i przyrodniczych, dziedzina nauk rolniczych, dziedzina nauk inżynieryjno-technicznych		
Academic disciplines	nauki biologiczne (5%), technologia żywności i żywienia (10%), rolnictwo i ogrodnictwo (10%), inżynieria chemiczna (5%), inżynieria materiałowa (10%), zootechnika i rybactwo (60%)		
Educational profile	ogólnoakademicki		
Module			
Course unit	**German language**		
Code	BT_2A_S_20/21_BTA-A-07.2		
Field of specialisation			
Administering faculty	Studium Praktycznej Nauki Języków Obcych		
ECTS	3,0	*ECTS (forms)*	3,0
Form of course credit	zaliczenie	*Language*	niemiecki
Electives	7	*Elective group*	

Form of instruction	*Cod*	*Semester*	*Hours*	*ECTS*	*Weight*	*Credit*
laboratoria	L	1	30	3,0	1,00	zaliczenie

Leading teacher	Maziarz Anna (Anna.Maziarz@zut.edu.pl)
Other teachers	Głębocka Katarzyna (Katarzyna.Glebocka@zut.edu.pl), Kamińska Grażyna (Grazyna.Kaminska@zut.edu.pl), Karelus Dorota (Dorota.Karelus@zut.edu.pl)

Prerequisites	
W-1	Knowledge of a language at B2 level acknowledged by the final exam or a language certificate at the required level.

Module/course unit objectives	
C-1	Development of communicative and language competences for special purposes.
C-2	Ability of individual work with technical texts related to his/her major.

Course content divided into various forms of instruction		*Number of hours*
T-L-1	Specialist vocabulary and text concerning the following subjects : Zellbiologie a. Struktur der Zelle ; das licht- und elektronenmikroskopische Bild der Zelle Lesestile und Lesestrategien	3
T-L-2	Stoffwechsel Muskel und Bewegung Relativsätze, erweitertes Attribut	6
T-L-3	Entwicklungsbiologie a. Reproduktionstechniken b. Entwicklungsstörungen Passiv, alternative Formen zum Passiv	3
T-L-4	Genetik Reproduktionstechniken - Klonen bei Pflanzen und Tieren - Embryonentransfer in der Tierzucht - Fortpflanzungsmedizin Konjunktionen, spezifische Anwendungen	6
T-L-5	Immunologie Allergien	3
T-L-6	Neurobiologie Nervensystem der Wirbeltiere Präsentation und ihre Evaluation in Form von Fragen, einer Diskussion und Standpunktbegründung. Erwägung der Vor- und Nachteile in vorgelegten Lösungen.	6
T-L-7	Hormone a. das endokrine System der Wirbeltiere b. Phytohormon, Pheromone Nomen-Verb-Verbindungen	3

Student workload - forms of activity		*Number of hours*
A-L-1	Practical classes	30

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Student workload - forms of activity		*Number of hours*
A-L-2	Preparation for classes	55
A-L-3	Individual tutorials	5

Teaching methods / tools	
M-1	Practical classes
M-2	Group work
M-3	Presentation
M-4	Discussion
M-5	Work with text
M-6	Listening comprehension

Evaluation methods (F - progressive, P - final)		
S-1	F	Presentation (F)
S-2	F	Written exam (S)

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6, 7 lub 8 PRK	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6 lub 7 umożliwiających uzyskanie kompetencji inżynierskich	Course objectives	Course content	Teaching methods	Evaluation methods
Knowledge							
BTap_2A_BTZ-A-07.2_W01 knows language structures used in specialist texts and selected specialist vocabulary for the programme of studies	BTap_2A_W01	P7S_WG		C-1	T-L-1 T-L-5 T-L-2 T-L-6 T-L-3 T-L-7 T-L-4	M-1 M-2 M-3 M-5	S-1 S-2
Skills							
BTap_2A_BTZ-A-07.2_U01 can speak on technical subjects related to his/her major	BTap_2A_U03	P7S_UK		C-1	T-L-1 T-L-5 T-L-2 T-L-6 T-L-3 T-L-7 T-L-4	M-1 M-2 M-3 M-4 M-6	S-1 S-2
BTap_2A_BTZ-A-07.2_U02 is able to understand texts and use basic specialist vocabulary in his/her field	BTap_2A_U03	P7S_UK		C-2	T-L-1 T-L-5 T-L-2 T-L-6 T-L-3 T-L-7 T-L-4	M-1 M-5	S-1 S-2
Social competences							
BTap_2A_BTZ-A-07.2_K01 is aware of the need of further education and self-improvement in developing language competences	BTap_2A_K01 BTap_2A_K07	P7S_KK P7S_KO P7S_KR		C-2	T-L-1 T-L-5 T-L-2 T-L-6 T-L-3 T-L-7 T-L-4	M-1 M-3	S-2

Outcomes	Grade	Evaluation criterion
Knowledge		
BTap_2A_BTZ-A-07.2_W01	*2,0*	
	3,0	Student has basic knowledge on language structures used in specialist texts.
	3,5	
	4,0	
	4,5	
	5,0	
Skills		
BTap_2A_BTZ-A-07.2_U01	*2,0*	
	3,0	Student can formulate short speeches on technical subjects.
	3,5	
	4,0	
	4,5	
	5,0	
BTap_2A_BTZ-A-07.2_U02	*2,0*	
	3,0	Student understands at least 60% of specialist texts he/she reads.
	3,5	
	4,0	
	4,5	
	5,0	

Other social competences		
BTap_2A_BTZ-A-07.2_K01	*2,0*	
	3,0	Student is aware of the need of further education and self-improvement in his/her profession.
	3,5	
	4,0	
	4,5	
	5,0	

Required reading
1. Duden, Basis Wissen Schule, Biologie Abitur, Bibliographisches Institut + Brockhaus, 2007, 2. Auflage
2. Walter Kleesattel, Cornelsen Abiturwissen Kompakt Biologie, Cornelsen Scriptor, 2004
3. Wikipedia, xyz, xyz, xyz, 2012

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Faculty of Biotechnology and Animal Husbandry

Field of study	Biotechnology		
Mode of study	stacjonarna	*Level*	drugi
Graduate's qualification	magister inżynier		
Fields of study	dziedzina nauk ścisłych i przyrodniczych, dziedzina nauk rolniczych, dziedzina nauk inżynieryjno-technicznych		
Academic disciplines	nauki biologiczne (5%), technologia żywności i żywienia (10%), rolnictwo i ogrodnictwo (10%), inżynieria chemiczna (5%), inżynieria materiałowa (10%), zootechnika i rybactwo (60%)		
Educational profile	ogólnoakademicki		
Module			
Course unit	**Health and safety in laboratory**		
Code	BT_2A_S_20/21_BTA-A-A3		
Field of specialisation			
Administering faculty	Katedra Biotechnologii Rozrodu Zwierząt i Higieny Środowiska		
ECTS	1,0	*ECTS (forms)*	1,0
Form of course credit	zaliczenie	*Language*	angielski
Electives		*Elective group*	

Form of instruction	*Cod*	*Semester*	*Hours*	*ECTS*	*Weight*	*Credit*
wykłady	W	1	10	1,0	1,00	zaliczenie

Leading teacher	Pilarczyk Bogumiła (Bogumila.Pilarczyk@zut.edu.pl)
Other teachers	Tomza-Marciniak Agnieszka (Agnieszka.Tomza-Marciniak@zut.edu.pl)

Prerequisites

W-1	Basic knowledge of chemistry, physics and principles of occupational health and safety

Module/course unit objectives

C-1	Gaining theoretical knowledge on the principles of health and safety at work in a biological laboratory.
C-2	Ability to react in dangerous situations in accordance with health and safety rules.

Course content divided into various forms of instruction		*Number of hours*
T-W-1	Hygiene and sanitary requirements for laboratory	1
T-W-2	Exposure to harmful factors in the workplace and at the university	1
T-W-3	Fire protection. Fire procedure. Fire evacuation strategy. Fire threats occurring in the University. Responsibilities of students in the field of fire protection at the place of trainingship and in the laboratory.	2
T-W-4	Ergonomics of work in the laboratory.	2
T-W-5	First premedical help	2
T-W-6	Accidents at work in the laboratory. Procedures for proceedings.	2

Student workload - forms of activity		*Number of hours*
A-W-1	participation in classes	10
A-W-2	study of literature	10
A-W-3	Preparing to pass lectures	10

Teaching methods / tools

M-1	Lecture with multimedia presentation and educational films.
M-2	Auditorium classes: group work, case analysis.

Evaluation methods (F - progressive, P - final)

S-1	F	assessment of the paper
S-2	P	test of choice + open tasks

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6, 7 lub 8 PRK	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6 lub 7 umożliwiających uzyskanie kompetencji inżynierskich	Course objectives	Course content	Teaching methods	Evaluation methods
Knowledge							

BT_2A_BTZ-A-A3_W01 Student knows and defines basic principles of occupational health and safety in the laboratory	BTap_2A_W04	P7S_WK		C-1 C-2	T-W-1 T-W-4 T-W-2 T-W-5 T-W-3 T-W-6	M-1 M-2	S-1 S-2
Skills							
BT_2A_BTZ-A-A3_U01 The student adheres to the basic principles of occupational safety and health in a biological laboratory, student is able to react in accordance with the principles of health and safety in dangerous situations.	BTap_2A_U10	P7S_UW		C-1 C-2	T-W-1 T-W-4 T-W-2 T-W-5 T-W-3 T-W-6	M-1 M-2	S-1 S-2
Social competences							
BT_2A_BTZ-A-A3_K01 The student is aware of the dangers in biological laboartories.	BTap_2A_K08	P7S_KO		C-1 C-2	T-W-1 T-W-4 T-W-2 T-W-5 T-W-3 T-W-6	M-1 M-2	S-2

Outcomes	Grade	Evaluation criterion
Knowledge		
BT_2A_BTZ-A-A3_W01	*2,0*	
	3,0	Student knows and defines most of basic principles of occupational health and safety in the laboratory.
	3,5	
	4,0	
	4,5	
	5,0	
Skills		
BT_2A_BTZ-A-A3_U01	*2,0*	
	3,0	The student adheres to the basic principles of occupational safety and health in a biological laboratory, student is able to react in accordance with the principles of health and safety in dangerous situations.
	3,5	
	4,0	
	4,5	
	5,0	
Other social competences		
BT_2A_BTZ-A-A3_K01	*2,0*	
	3,0	The student is aware of the dangers in biological laboartories.
	3,5	
	4,0	
	4,5	
	5,0	

Required reading

1. Benjamin O. ALLI, FUNDAMENTAL PRINCIPLES OF OCCUPATIONAL HEALTH AND SAFETY, INTERNATIONAL LABOUR OFFICE, GENEVA, 2008

2. Timothy Joseph Gallwey, Leonard O'Sullivan, Ergonomics Laboratory Exercises, CRC Press, 2008

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Faculty of Biotechnology and Animal Husbandry

Field of study	Biotechnology		
Mode of study	stacjonarna	*Level*	drugi
Graduate's qualification	magister inżynier		
Fields of study	dziedzina nauk ścisłych i przyrodniczych, dziedzina nauk rolniczych, dziedzina nauk inżynieryjno-technicznych		
Academic disciplines	nauki biologiczne (5%), technologia żywności i żywienia (10%), rolnictwo i ogrodnictwo (10%), inżynieria chemiczna (5%), inżynieria materiałowa (10%), zootechnika i rybactwo (60%)		
Educational profile	ogólnoakademicki		
Module			
Course unit	**Ethic, legal and economic aspects of biotechnology**		
Code	BT_2A_S_20/21_BTA-A-A4		
Field of specialisation			
Administering faculty	Katedra Biotechnologii Rozrodu Zwierząt i Higieny Środowiska		
ECTS	2,0	*ECTS (forms)*	2,0
Form of course credit	zaliczenie	*Language*	angielski
Electives		*Elective group*	

Form of instruction	*Cod*	*Semester*	*Hours*	*ECTS*	*Weight*	*Credit*
konwersatoria	K	1	30	2,0	1,00	zaliczenie

Leading teacher	Stankiewicz Tomasz (Tomasz.Stankiewicz@zut.edu.pl)
Other teachers	Terman Arkadiusz (Arkadiusz.Terman@zut.edu.pl)

Prerequisites

W-1	Basic knowledge in the field of biological sciences and humanities.

Module/course unit objectives

C-1	Understanding current trends and theories concerning the development of humanity and the place of man in nature in the aspect of the dynamic development of biological sciences.
C-2	To acquaint students with the ethical and legal conditioning and to develop their proper attitude in the context of the possibilities and purposefulness of genetic modifications in animals and humans.

Course content divided into various forms of instruction		*Number of hours*
T-K-1	The power of nature - the size of a man. A shared world. The duration of finite length. The good of man before his freedom. Technical possibilities and the ethics of pragmatic action.	6
T-K-2	Genetic modifications and health and "quality" of life as well as cancerous transformation of the cell. Stem cells and ethical assessment of their use. Theory of disposable structures. The effectiveness of therapy.	6
T-K-3	Transgenesis - transgenic organisms: objectives, methods of preparing, risks arising from the introduction of transgenic organisms, organizations fighting GMOs. Social and economic aspects. Ethical determinants of gene therapy, tumor gene therapy, gene therapy in Poland.	8
T-K-4	Cloning - cloning of animals and people, reasons for current research on cloning, cloning and personality transfer, basic ethical, economic and legal problems.	4
T-K-5	Transplantation - organ transplantation: historical outline, medical aspects, ethical (transplantation in particular religious systems), legal and economic. Limitations and challenges of xenotransplantation.	4
T-K-6	Ethical, legal and practical aspects of in vitro fertilization and sex regulation.	2

Student workload - forms of activity		*Number of hours*
A-K-1	Participation in the classes.	30
A-K-2	Preparing for classes.	15
A-K-3	Preparation of papers.	10
A-K-4	Preparing to pass the classes.	5

Teaching methods / tools

M-1	Panel disscusion.
M-2	Information lecture using multimedia techniques.
M-3	Conversational lecture.

Evaluation methods (F - progressive, P - final)

S-1	F	Assessment of involvement and active participation on the classes.

Evaluation methods (F - progressive, P - final)		
S-2	F	Assessment of preparation for classes in oral or written form.
S-3	P	Periodic evaluation covering the scope of program content.

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6, 7 lub 8 PRK	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6 lub 7 umożliwiających uzyskanie kompetencji inżynierskich	Course objectives	Course content	Teaching methods	Evaluation methods
Knowledge							
BT_2A_BTZ-A-A4_W01 The student has knowledge of current trends and directions of research in biological sciences. He knows theories and views about the role and place of man in nature, indicates the possibilities and possible consequences of genetic modification.	BTap_2A_W02	P7S_WK	P7S_WK	C-1	T-K-1 T-K-3 T-K-2	M-1 M-2 M-3	S-1 S-2 S-3
BT_2A_BTZ-A-A4_W02 The student knows the basic legal acts regarding the work with genetically modified organisms and knows the positions and views of various social groups regarding genetic identity.	BTap_2A_W02 BTap_2A_W05	P7S_WK	P7S_WK	C-2	T-K-4 T-K-6 T-K-5	M-1 M-2 M-3	S-1 S-2 S-3
Skills							
BT_2A_BTZ-A-A4_U01 The student is able to present and evaluate the importance of the most important discoveries in the field of molecular biology and biotechnology for the development of science and to indicate the limits of human responsibility in the natural world.	BTap_2A_U01	P7S_UW		C-1	T-K-1 T-K-3 T-K-2	M-1 M-2 M-3	S-1 S-2 S-3
BT_2A_BTZ-A-A4_U02 The student is able to present the meaning of legal and ethical regulations and public awareness in the development of biological sciences and use of the achievements of modern biotechnology.	BTap_2A_U01	P7S_UW		C-2	T-K-4 T-K-6 T-K-5	M-1 M-2 M-3	S-1 S-2 S-3
Social competences							
BT_2A_BTZ-A-A4_K01 The student is aware of the impact of the achievements of science on the development of humanity and nature and the possible consequences of their uncontrolled use.	BTap_2A_K04	P7S_KR		C-1	T-K-1 T-K-3 T-K-2	M-1	S-1
BT_2A_BTZ-A-A4_K02 The student shows commitment and creativity in teamwork and is aware of the influence of persuasion skills on the attitude of other group members and the results achieved by them.	BTap_2A_K04	P7S_KR		C-2	T-K-4 T-K-5	M-1	S-1

Outcomes	Grade	Evaluation criterion
Knowledge		
BT_2A_BTZ-A-A4_W01	*2,0*	
	3,0	The student has a basic knowledge of the current directions of research in biological sciences. He can present some views on the role of man in nature, although he is not able to develop the subject further.
	3,5	
	4,0	
	4,5	
	5,0	
BT_2A_BTZ-A-A4_W02	*2,0*	
	3,0	The student has a basic knowledge of activities carried out in the international dimension in order to develop a consensual position regarding the preservation of biodiversity and legal regulations. He can point to selected economic and social benefits resulting from the use of biotechnology achievements, although he has difficulties with giving specific examples.
	3,5	
	4,0	
	4,5	
	5,0	
Skills		
BT_2A_BTZ-A-A4_U01	*2,0*	
	3,0	The student can explain the meaning of some achievements in the field of biology and biotechnology for the development of biological sciences. He can indicate, on the basis of selected philosophical theories, the role and place of man in the world of nature.
	3,5	
	4,0	
	4,5	
	5,0	

Skills		
BT_2A_BTZ-A-A4_U02	*2,0*	
	3,0	The student can combine achievements in the field of biotechnology with social and economic benefits. He associates and explains the meaning of legal regulations for the preservation of biodiversity and the development of biotechnology.
	3,5	
	4,0	
	4,5	
	5,0	
Other social competences		
BT_2A_BTZ-A-A4_K01	*2,0*	
	3,0	The student is aware of the importance of achievements in biology and biotechnology for the development of humanity, does not avoid taking action, but also does not take them willingly.
	3,5	
	4,0	
	4,5	
	5,0	
BT_2A_BTZ-A-A4_K02	*2,0*	
	3,0	The student shows the ability to work in a group, but the task performs ineptly, showing a moderate commitment.
	3,5	
	4,0	
	4,5	
	5,0	

Required reading

1. Sherlock R., Morrey J.D., Ethical Issues in biotechnology, Roman & Littefield Publishers INC., Boston Way, Lanham, Maryland, 2002

Supplementary reading

1. Alam K. F., Biotechnology fundamentals., Taylor & Francis Inc, 2016, Second Edition

Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Faculty of Biotechnology and Animal Husbandry

Field of study	Biotechnology		
Mode of study	stacjonarna	*Level*	drugi
Graduate's qualification	magister inżynier		
Fields of study	dziedzina nauk ścisłych i przyrodniczych, dziedzina nauk rolniczych, dziedzina nauk inżynieryjno-technicznych		
Academic disciplines	nauki biologiczne (5%), technologia żywności i żywienia (10%), rolnictwo i ogrodnictwo (10%), inżynieria chemiczna (5%), inżynieria materiałowa (10%), zootechnika i rybactwo (60%)		
Educational profile	ogólnoakademicki		
Module			
Course unit	**Master seminar**		
Code	BT_2A_S_20/21_BTA-A-A5		
Field of specialisation			
Administering faculty	Katedra Biotechnologii Rozrodu Zwierząt i Higieny Środowiska		
ECTS	2,0	*ECTS (forms)*	2,0
Form of course credit	zaliczenie	*Language*	polski
Electives		*Elective group*	

Form of instruction	*Cod*	*Semester*	*Hours*	*ECTS*	*Weight*	*Credit*
seminaria	S	2	30	2,0	1,00	zaliczenie

Leading teacher	Stankiewicz Tomasz (Tomasz.Stankiewicz@zut.edu.pl)
Other teachers	

Prerequisites

W-1	Completion of the library training
W-2	The ability to edit the text
W-3	The knowledge and ability to use statistical methods in biotechnology

Module/course unit objectives

C-1	Preparing a master thesis. Preparing for a thesis defense.
C-2	The students become acquainted with the softwares and information services that enable searching for materials used in thesis. The studends gain knowledge concerning techniques and ways of formulating questions and database searching. The students are informed how they can access the full text of journal articles. They are able to create a bibligraphy by themselves either using a bibligraphic management tools. The students become acquainted with the ethical aspects in scientific work and the basis of copyright.

Course content divided into various forms of instruction		*Number of hours*
T-S-1	To make all students familiar with the criteria as well as editorial requirements for writing master thesis in the fileld of biotechnology. Disscusion of the Master's graduation procedure in the Faculty.	2
T-S-2	What is plagiarism - legal consequences of plagiarism.	2
T-S-3	Guidelines for students beginning a research study and organisation of a workshop.	2
T-S-4	The pronciples of selecting research methods. Technical rules on compilating the results - creation of tables, graphs and drawings.	6
T-S-5	The principles of selecting and analysing a sientific literature. Links to the literature, bibliography. Linguistic problems and methods to overcome it, foreign language terms.	7
T-S-6	Guidelines for the preparation of the firt version of master's thesis. Organizing the writing process. Analysis of the reference text. Guidelines concerning writing a discussion section and formulating conclusions.	5
T-S-7	Guidelines for preparing a research presentation.	6

Student workload - forms of activity		*Number of hours*
A-S-1	Participation in classes	30
A-S-2	Analysis and processing of source materials	15
A-S-3	Collecting materials for diploma thesis; preliminary assessment of collected source material	15

Teaching methods / tools

M-1	Independent work of a student coordinated by a thesis advisor during consultation hours.

Evaluation methods (F - progressive, P - final)

S-1	F	Continuous assessment of students' work progress during consultation.

Evaluation methods (F - progressive, P - final)

S-2	P	Diploma exam and defense of the master thesis.

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6, 7 lub 8 PRK	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6 lub 7 umożliwiających uzyskanie kompetencji inżynierskich	Course objectives	Course content	Teaching methods	Evaluation methods
Knowledge							
BT_2A_BTZ-A-A5_W01 The student has an advanced knowledge concerning the methods, techniques, tools and materials allowing for analysis and exploiting nature's potential.	BTap_2A_W08	P7S_WG	P7S_WG	C-1	T-S-1 T-S-5 T-S-2 T-S-6 T-S-3 T-S-7 T-S-4	M-1	S-1
BT_2A_BTZ-A-A5_W02 The student knows the methodology of preparing and writing master thesis. The student knows the softwares and information services that enable searching for materials used in thesis. The student is fully aware of the techniques and ways of formulating questions and database searching. He/She knows how he can access the full text of journal articles. He/She knows the rules concerning a creation a bibligraphy by himself/herself either using a bibligraphic management tools. He/She is aware of the ethical aspects in scientific work and the basis of copyright.	BTap_2A_W11	P7S_WG	P7S_WG	C-1	T-S-1 T-S-5 T-S-2 T-S-6 T-S-3 T-S-7 T-S-4	M-1	S-1
Skills							
BT_2A_BTZ-A-A5_U01 Student has an ability to conduct research experiments and/or to use a laboratory diagnostics methods depending on the character of master thesis.	BTap_2A_U05 BTap_2A_U09	P7S_UK P7S_UO P7S_UU P7S_UW	P7S_UW	C-1	T-S-1 T-S-5 T-S-2 T-S-6 T-S-3 T-S-7 T-S-4	M-1	S-1
BT_2A_BTZ-A-A5_U02 While working on the final preparation of master thesis, student uses his/hers deepen knowledge on statistical and bioinformatic analysis. The student knows how to select proper softwares and information services that enable searching for materials used in thesis. He/She knows how he can access the full text of journal articles. He/She knows the rules concerning a creation a bibligraphy by himself/herself either using a bibligraphic management tools.	BTap_2A_U02	P7S_UW	P7S_UW	C-1	T-S-1 T-S-5 T-S-2 T-S-6 T-S-3 T-S-7 T-S-4	M-1	S-1
Social competences							
BT_2A_BTZ-A-A5_K01 The student shows comprehension and confidence of knowability of the processess and biological phenomenons that are the subject of his/hers master thesis.	BTap_2A_K02	P7S_KK		C-1	T-S-1 T-S-5 T-S-2 T-S-6 T-S-3 T-S-7 T-S-4	M-1	S-1
BT_2A_BTZ-A-A5_K02 The student understands the meaning of ethical and social aspets related with research and professional work and intelectual honesty. He/She knows how to use the scientific databases. He/She develops the ability of scientific communication. He/She is aware of ethical aspects of scientific work - he/she knows the basis of copyright.	BTap_2A_K04 BTap_2A_K07	P7S_KO P7S_KR		C-1	T-S-1 T-S-5 T-S-2 T-S-6 T-S-3 T-S-7 T-S-4	M-1	S-1

Outcomes	Grade	Evaluation criterion
Knowledge		
BT_2A_BTZ-A-A5_W01	*2,0*	Evaluation criteria are individually established by a thesis supervisor.
	3,0	Evaluation criteria are individually established by a thesis supervisor.
	3,5	Evaluation criteria are individually established by a thesis supervisor.
	4,0	Evaluation criteria are individually established by a thesis supervisor.
	4,5	Evaluation criteria are individually established by a thesis supervisor.
	5,0	Evaluation criteria are individually established by a thesis supervisor.
BT_2A_BTZ-A-A5_W02	*2,0*	Evaluation criteria are individually established by a thesis supervisor.
	3,0	Evaluation criteria are individually established by a thesis supervisor.
	3,5	Evaluation criteria are individually established by a thesis supervisor.
	4,0	Evaluation criteria are individually established by a thesis supervisor.
	4,5	Evaluation criteria are individually established by a thesis supervisor.
	5,0	Evaluation criteria are individually established by a thesis supervisor.
Skills		
BT_2A_BTZ-A-A5_U01	*2,0*	Evaluation criteria are individually established by a thesis supervisor.
	3,0	Evaluation criteria are individually established by a thesis supervisor.
	3,5	Evaluation criteria are individually established by a thesis supervisor.
	4,0	Evaluation criteria are individually established by a thesis supervisor.
	4,5	Evaluation criteria are individually established by a thesis supervisor.
	5,0	Evaluation criteria are individually established by a thesis supervisor.

Skills		
BT_2A_BTZ-A-A5_U02	*2,0*	Evaluation criteria are individually established by a thesis supervisor.
	3,0	Evaluation criteria are individually established by a thesis supervisor.
	3,5	Evaluation criteria are individually established by a thesis supervisor.
	4,0	Evaluation criteria are individually established by a thesis supervisor.
	4,5	Evaluation criteria are individually established by a thesis supervisor.
	5,0	Evaluation criteria are individually established by a thesis supervisor.
Other social competences		
BT_2A_BTZ-A-A5_K01	*2,0*	Evaluation criteria are individually established by a thesis supervisor.
	3,0	Evaluation criteria are individually established by a thesis supervisor.
	3,5	Evaluation criteria are individually established by a thesis supervisor.
	4,0	Evaluation criteria are individually established by a thesis supervisor.
	4,5	Evaluation criteria are individually established by a thesis supervisor.
	5,0	Evaluation criteria are individually established by a thesis supervisor.
BT_2A_BTZ-A-A5_K02	*2,0*	Evaluation criteria are individually established by a thesis supervisor.
	3,0	Evaluation criteria are individually established by a thesis supervisor.
	3,5	Evaluation criteria are individually established by a thesis supervisor.
	4,0	Evaluation criteria are individually established by a thesis supervisor.
	4,5	Evaluation criteria are individually established by a thesis supervisor.
	5,0	Evaluation criteria are individually established by a thesis supervisor.

Required reading

1. Andrews G., How to write a master's dissertation: outline and examples, Amazon Digital Services LLC, 2017

2. Sahlman P., How to write a masters thesis fast: Practical productivity tips for students, Amazon Digital Services LLC, 2012

3. Andrews G., Writing your dissertation literature review: a step-by-step guide (Essay and Thesis Writing Book 8), Amazon Digital Services LLC, 2017

Supplementary reading

1. Andrews G., Academic writing guide: paragraph structure (Essay and Thesis Writing Book 11), Amazon Digital Services LLC, 2017

Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Faculty of Biotechnology and Animal Husbandry

Field of study	Biotechnology		
Mode of study	stacjonarna	*Level*	drugi
Graduate's qualification	magister inżynier		
Fields of study	dziedzina nauk ścisłych i przyrodniczych, dziedzina nauk rolniczych, dziedzina nauk inżynieryjno-technicznych		
Academic disciplines	nauki biologiczne (5%), technologia żywności i żywienia (10%), rolnictwo i ogrodnictwo (10%), inżynieria chemiczna (5%), inżynieria materiałowa (10%), zootechnika i rybactwo (60%)		
Educational profile	ogólnoakademicki		
Module			
Course unit	**Design of experiments**		
Code	BT_2A_S_20/21_BTA-A-B1		
Field of specialisation			
Administering faculty	Katedra Nauk o Zwierzętach Przeżuwających		
ECTS	2,0	*ECTS (forms)*	2,0
Form of course credit	zaliczenie	*Language*	angielski
Electives		*Elective group*	

Form of instruction	*Cod*	*Semester*	*Hours*	*ECTS*	*Weight*	*Credit*
projekty	P	1	15	1,0	0,41	zaliczenie
wykłady	W	1	15	1,0	0,59	zaliczenie

Leading teacher	Sablik Piotr (Piotr.Sablik@zut.edu.pl)
Other teachers	

Prerequisites

W-1	The knowledge of statistical methods used in life sciences. The basic knowledge of genetic methods, biology and biotechnology of living organisms

Module/course unit objectives

C-1	The course prepares students for conducting and supervising scientific research, tests, and implementation research, writing research projects, scientific publications, logical inference, presenting the aims and results of research projects

Course content divided into various forms of instruction		*Number of hours*
T-P-1	Experimental project preparation: experimental design (basic concepts), experiment preparation (subject selection and justification); determination of the aim of the study	2
T-P-2	Experimental project preparation: formulation of a working hypothesis, description of expected benefits, selection of an experimental design; description of experimental conditions; selection and pooling of a research material	2
T-P-3	Experimental project preparation: determination of experimental methods (sampling, experimental control, parameter selection for an analysis), selection of statistical software; statistical analysis	2
T-P-4	Experimental project preparation: research project schedule; its structure; schedule optimization; experiment analysis	2
T-P-5	Research project description and evaluation. Project estimate and its components	3
T-P-6	Experimental design presentation. Presentation forms. The use of computer programs and audiovisual media	2
T-P-7	Collation of experimental data. Tables, figures, graphs. Identification of statistically significant differences among experimental groups and their presentation in tables	2
T-W-1	The basic concepts of experimentation. Empirical methods of scientific research, scientific observation and scientific experiment. Scientific hypotheses	2
T-W-2	Statistical data. Population and sample. Variability, its sources, evaluation methods, difference significance, statistical inference	2
T-W-3	The principles of preparing and conducting an experiment. Classification of experiments. Types of agrotechnical, zootechnical and medical experiments. Subject selection	2
T-W-4	The formulation of a working hypothesis. Sample selection. Research material pooling. The sources of systematic errors	2
T-W-5	Basic experimental designs. Design types. One-factor and multi-factor experiments. Continuous and rotational designs, pooled observations	2
T-W-6	Experimental techniques for different animal and plant species. Experimental documentation	2
T-W-7	Observation making and collection. Collation and interpretation of research results. Description and presentation of results. The written reports of experimental results. The plan of scientific work. Scientist’s ethics	3

Student workload - forms of activity	*Number of hours*

Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Faculty of Biotechnology and Animal Husbandry

Student workload - forms of activity		*Number of hours*
A-P-1	Attending classes	15
A-P-2	Research project preparation	5
A-P-3	Preparation for classes	5
A-P-4	Consultations	5
A-P-5	Final test	1
A-W-1	Attending lectures	15
A-W-2	Studying the issues discussed during lectures	5
A-W-3	Consultations	5
A-W-4	Preparation for examination	3
A-W-5	Examination	2

Teaching methods / tools	
M-1	Lecture
M-2	Practical classes using computers and appropriate software
M-3	Project method

Evaluation methods (F - progressive, P - final)		
S-1	P	A written test including subjects presented during lectures
S-2	P	Evaluation of the project and multimedia presentation

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6, 7 lub 8 PRK	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6 lub 7 umożliwiających uzyskanie kompetencji inżynierskich	Course objectives	Course content	Teaching methods	Evaluation methods
Knowledge							
BT_2A_BTZ-A-B1_W01 A student knows the methods and principles of research project preparation, research and scientific work	BTap_2A_W11	P7S_WG	P7S_WG	C-1	T-P-1 T-W-1 T-P-2 T-W-2 T-P-3 T-W-3 T-P-4 T-W-4 T-P-5 T-W-5 T-P-6 T-W-6 T-P-7 T-W-7	M-1 M-2 M-3	S-1 S-2
Skills							
BT_2A_BTZ-A-B1_U01 A student can design, conduct and analyze biotechnological experiments and apply appropriate tools	BTap_2A_U01 BTap_2A_U02	P7S_UW	P7S_UW	C-1	T-P-1 T-P-5 T-P-2 T-P-6 T-P-3 T-P-7 T-P-4	M-2 M-3	S-2
Social competences							
BT_2A_BTZ-A-B1_K01 A student can creatively prepare a research project by herself/himself and as a team member	BTap_2A_K05	P7S_KO P7S_KR		C-1	T-P-1 T-P-5 T-P-2 T-P-6 T-P-3 T-P-7 T-P-4	M-2 M-3	S-2

Outcomes	Grade	Evaluation criterion
Knowledge		
BT_2A_BTZ-A-B1_W01	*2,0*	
	3,0	A student knows the basic aspects of preparing, conducting and analyzing experiments and research
	3,5	
	4,0	
	4,5	
	5,0	
Skills		
BT_2A_BTZ-A-B1_U01	*2,0*	
	3,0	A student can prepare a research project with the help from a lecturer
	3,5	
	4,0	
	4,5	
	5,0	

Other social competences		
BT_2A_BTZ-A-B1_K01	*2,0*	
	3,0	A student acquired skills suggesting a moderately active attitude towards knowledge acquisition and self-teaching
	3,5	
	4,0	
	4,5	
	5,0	

Required reading

1. Ruszczyc Z., Metodyka doświadczeń zootechnicznych, PWRiL, Warszawa, 1981, IV
2. Łubkowski Z., Metodyka doświadczalnictwa rolniczego, PWRiL, Warszawa, 1968
3. Bochno R., Lewczuk A., Biometria stosowana. Przewodnik do ćwiczeń, Dz. Wyd. Olsztyn, Olsztyn, 1980
4. Łomnicki A., Wprowadzenie do statystyki dla przyrodników, PWN, Warszawa, 2003
5. Oktawa W., Elementy statystyki matematycznej i metodyka doświadczalnictwa, PWN, Warszawa, 1980
6. Weiner J., Technika pisania i prezentowania przyrodniczych prac naukowych, PWN, Warszawa, 2009

Supplementary reading

1. Falińska K., Przewodnik do badań biologii populacji roślin, PWN, Warszawa, 2002

Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Faculty of Biotechnology and Animal Husbandry

Field of study	Biotechnology		
Mode of study	stacjonarna	*Level*	drugi
Graduate's qualification	magister inżynier		
Fields of study	dziedzina nauk ścisłych i przyrodniczych, dziedzina nauk rolniczych, dziedzina nauk inżynieryjno-technicznych		
Academic disciplines	nauki biologiczne (5%), technologia żywności i żywienia (10%), rolnictwo i ogrodnictwo (10%), inżynieria chemiczna (5%), inżynieria materiałowa (10%), zootechnika i rybactwo (60%)		
Educational profile	ogólnoakademicki		
Module			
Course unit	**Procedures of intellectual property and industrial protection in biotechnology**		
Code	BT_2A_S_20/21_BTA-A-C1		
Field of specialisation			
Administering faculty	Dział Wynalazczości i Ochrony Patentowej		
ECTS	1,0	*ECTS (forms)*	1,0
Form of course credit	zaliczenie	*Language*	angielski
Electives		*Elective group*	

Form of instruction	*Cod*	*Semester*	*Hours*	*ECTS*	*Weight*	*Credit*
wykłady	W	1	10	1,0	1,00	zaliczenie

Leading teacher	Zawadzka Renata (Renata.Zawadzka@zut.edu.pl)
Other teachers	

Prerequisites

W-1	certificated knowledge of bases of intellectal property- copyrights and industrial property. Certification may be positive grade given after at least 10 hours cours "Intellecual property proection" or "Copyrights protection"

Module/course unit objectives

C-1	presentation to students different kinds of patent examination, classifications (international patent, nice, viena, locarno) and databases for invention, utility models, designs, trade marks (PPO databeses, espacenet, romarin, hague express, EUIPO bases); showing to student what kind of information can be found in databases and how can they use such information.

Course content divided into various forms of instruction		*Number of hours*
T-W-1	repetition of knowledge about bases of intellectual property	2
T-W-2	presentation of databases: PPO databases, romarin, hague express, EUIPO bases, espacenet	6
T-W-3	presentation of classifications (international patent, nice, viena, locarno)	2

Student workload - forms of activity		*Number of hours*
A-W-1	participation in classes	10
A-W-2	searching in databases	8
A-W-3	searching in classifications	4
A-W-4	making a written elaborate based on search made in databases	8

Teaching methods / tools

M-1	lecture joint with student's practical work with databases

Evaluation methods (F - progressive, P - final)

S-1	P	grade for written elaborate based on search made in databases

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6, 7 lub 8 PRK	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6 lub 7 umożliwiających uzyskanie kompetencji inżynierskich	Course objectives	Course content	Teaching methods	Evaluation methods
Knowledge							
BT_2A_BTZ-A-C1_W01 student chooses right databases for subject of search; students identifies subject of intellectual propery rights in products and services; student knows bases of intellectual propery protection	BTap_2A_W02	P7S_WK	P7S_WK	C-1	T-W-1 T-W-3 T-W-2	M-1	S-1
Skills							

BT_2A_BTZ-A-C1_U01 student can finde information in databases; student understands information indicate in databases; student can use information obtain from databases in planing further proceedings	BTap_2A_U09	P7S_UW	P7S_UW	C-1	T-W-1 T-W-3 T-W-2	M-1	S-1
Social competences							
BT_2A_BTZ-A-C1_K01 student knows that during making decision should follows rules indicate in law; student makes task in specified time student knows that his/her behaviour can cause the infrigement of intellectual propery rights	BTap_2A_K01 BTap_2A_K04 BTap_2A_K08	P7S_KK P7S_KO P7S_KR		C-1	T-W-1 T-W-3 T-W-2	M-1	S-1

Outcomes	Grade	Evaluation criterion
Knowledge		
BT_2A_BTZ-A-C1_W01	*2,0*	student is unable to make searching in database independent; student doesn't know where and what should search; student doesn't choose right database in accordance to search subject; student can't make independent conclusion or make mistake conclusion
	3,0	student can partly choose: right databases, right criterions to search in databases. Student is inactive.
	3,5	student proceeds between note 3,0 and 4,0
	4,0	student chooses right databases, right criterion to search in databases, is active and independent during work, can prepare right conclusion (student's work has some mistakes)
	4,5	student chooses right databases, right criterion to search in databases, is active and independent during work, can prepare right conclusion (student's work has only few mistakes)
	5,0	student chooses right databases, right criterion to search in databases, is active, creative and independent during work, can prepare right conclusion
Skills		
BT_2A_BTZ-A-C1_U01	*2,0*	student is unable to independent work, doesn't understad what should do, can't choose right databases, can't make his/her own conclusion or conclusion aren't right
	3,0	student partly chooses right databases to search, partly chooses rigt criterias to search, is unactive during wark,
	3,5	student proceeds between note 3,0 and 4,0
	4,0	student chooses right databases, right criterion to search in databases, is active and independent during work, can prepare right conclusion (student's work has some mistakes)
	4,5	student chooses right databases, right criterion to search in databases, is active and independent during work, can prepare right conclusion (student's work has only few mistakes)
	5,0	student chooses right databases, right criterion to search in databases, is active, creative and independent during work, can prepare right conclusion
Other social competences		
BT_2A_BTZ-A-C1_K01	*2,0*	student is unable to make searching in database independent; student doesn't know where and what should search; student doesn't choose right database in accordance to search subject; student can't make independent conclusion or makes mistake conclusion
	3,0	student can partly choose: right databases, right criterions to search in databases. Student is inactive
	3,5	student chooses right databases, right criterion to search in databases, is active and independent during work, can prepare right conclusion (student's work has some mistakes)
	4,0	student chooses right databases, right criterion to search in databases, is active and independent during work, can prepare right conclusion (student's work has some mistakes)
	4,5	student chooses right databases, right criterion to search in databases, is active and independent during work, can prepare right conclusion (student's work has only few mistakes)
	5,0	student chooses right databases, right criterion to search in databases, is active, creative and independent during work, can prepare right conclusion

Supplementary reading

1. Act of 30 june 2000r. Industrial Property Law, Dz. U. z 2017r. poz. 776

Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Faculty of Biotechnology and Animal Husbandry

Field of study	Biotechnology		
Mode of study	stacjonarna	*Level*	drugi
Graduate's qualification	magister inżynier		
Fields of study	dziedzina nauk ścisłych i przyrodniczych, dziedzina nauk rolniczych, dziedzina nauk inżynieryjno-technicznych		
Academic disciplines	nauki biologiczne (5%), technologia żywności i żywienia (10%), rolnictwo i ogrodnictwo (10%), inżynieria chemiczna (5%), inżynieria materiałowa (10%), zootechnika i rybactwo (60%)		
Educational profile	ogólnoakademicki		
Module			
Course unit	**Basics of contemporary microscopy**		
Code	BT_2A_S_20/21_BTA-A-D1		
Field of specialisation			
Administering faculty	Katedra Fizjologii, Cytobiologii i Proteomiki		
ECTS	4,0	*ECTS (forms)*	4,0
Form of course credit	egzamin	*Language*	angielski
Electives		*Elective group*	

Form of instruction	*Cod*	*Semester*	*Hours*	*ECTS*	*Weight*	*Credit*
laboratoria	L	1	20	2,0	0,41	zaliczenie
wykłady	W	1	20	2,0	0,59	egzamin

Leading teacher	Michałek Katarzyna (Katarzyna.Michalek@zut.edu.pl)
Other teachers	Kochmańska Agnieszka (Agnieszka.Kochmanska@zut.edu.pl)

Prerequisites	
W-1	Basics of the physics and structure, morphology of living organisms

Module/course unit objectives	
C-1	Get knowledge about modern microscopy
C-2	To familiarise students with the microscopy techniques and equipment used in the study of living organisms structure

Course content divided into various forms of instruction		*Number of hours*
T-L-1	Drying at a critical point of CO2, vacuum spraying of samples using in SEM, observations in SEM, interpretation of SE and BSE images.	3
T-L-2	Optical microscopy. Metallographic and biologic microscope. Observations in the light and dark field; in polarized light and using interference contrast.	3
T-L-3	X-ray EDS microanalysis.	2
T-L-4	Atomic force microscope AFM	2
T-L-5	The hematoxylin and eosine procedures (H&E). Application of H&E stain. Staining of tissue section with the use of H&E technique.	3
T-L-6	Histochemical techniques of tissue staining. Application of periodic acid Schiff (PAS) stain. Staining of renal tissue wit the use of PAS technique.	3
T-L-7	Immunohistechemistry (IHC). Application of IHC. Antigen retrieval. Permabilization. Blocking. Primary antibody selection and optimization. Antibody specifity. Chromogenic detection. IHC controls. Immunolocalization of aquaporin 1 (AQP1) in the renal cortex and medulla	4
T-W-1	Basics of light optics. Construction of an optical microscope. Types of microscopic techniques in modern biology.	3
T-W-2	Basics of electron optics.	1
T-W-3	Scanning electron microscope SEM. Principle of working, construction of the microscope. Types of images. Preparation.	3
T-W-4	Transmission electron microscope TEM. Principle of working, construction of the microscope. Preparation.	3
T-W-5	X-ray microanalysis EDS and WDS.	2
T-W-6	Scanning Probe Microscope SPM: Scanning Tunelling Microscope STM; Atomic Force Microscope AFM.	2
T-W-7	Collection and preparation of biological samples for microscopic examination. Fixation, dehydratation, embedding and sectioning. Tissue preservation. Parraffin-embedded tissue. Frozen tissue. Microtome. Crystostat.	2
T-W-8	Tissue staining. Histological techniques (hematoxylin and eosin (H&E), periodic acid Schiff (PAS), Masson’s trichome stain, van Gison’s stain. Immunohistochemistry application. Analysis and interpretation of microscopic images	4

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Student workload - forms of activity		*Number of hours*
A-L-1	Mandatory participation in laboratories	20
A-L-2	Study of recommended literature	20
A-L-3	Preparing for the laboratory analysis	20
A-W-1	Participation in lectures	20
A-W-2	Learning for the colloquium I	10
A-W-3	Learning for the colloquium II	10
A-W-4	Self study content of the lectures	10
A-W-5	Study of recommended literature	10

Teaching methods / tools	
M-1	Informative lectures with the use of multimedia presentation
M-2	Laboratory works

Evaluation methods (F - progressive, P - final)		
S-1	F	written test
S-2	F	Assesment of student activity and preparing for classes

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6, 7 lub 8 PRK	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6 lub 7 umożliwiających uzyskanie kompetencji inżynierskich	Course objectives	Course content	Teaching methods	Evaluation methods
Knowledge							
BTap_2A_BTA-A-D1_W01 Student has a basic knowledge in the frame of material program. Student can enurate and describe commonly used microscopic techniques.	BTap_2A_W01	P7S_WG		C-1 C-2	T-W-1 T-W-5 T-W-2 T-W-6 T-W-3 T-W-7 T-W-4 T-W-8	M-1	S-1
Skills							
BTap_2A_BTA-A-D1_U01 Student is able to use commonly know microscopic techniques	BTap_2A_U08	P7S_UW	P7S_UW	C-1 C-2	T-L-1 T-L-5 T-L-2 T-L-6 T-L-3 T-L-7 T-L-4	M-2	S-2
Social competences							
BTap_2A_BTA-A-D1_K01 Student ia aware that there is a number microscopic methods to analyse structure of living organism.	BTap_2A_K05	P7S_KO P7S_KR		C-1	T-L-1 T-W-2 T-L-2 T-W-3 T-L-3 T-W-4 T-L-4 T-W-5 T-L-5 T-W-6 T-L-6 T-W-7 T-L-7 T-W-8 T-W-1	M-1 M-2	S-2

Outcomes	Grade	Evaluation criterion
Knowledge		
BTap_2A_BTA-A-D1_W01	*2,0*	
	3,0	Student has a basic knowledge in the frame of material program
	3,5	
	4,0	
	4,5	
	5,0	
Skills		
BTap_2A_BTA-A-D1_U01	*2,0*	
	3,0	Student with the help of teacher is able to use commonlly know microscopic techniques
	3,5	
	4,0	
	4,5	
	5,0	
Other social competences		
BTap_2A_BTA-A-D1_K01	*2,0*	
	3,0	Student express moderate interest in participating in verbal disccusion with the teacher and classmates during classes
	3,5	
	4,0	
	4,5	
	5,0	

Required reading
1. BRUCKER, MICROX-RAY FLUORESCENCE SPECTROSCOPY, John Wiley & Sons Ltd, 2015
2. M. A. Nasser Hajibagheri, Electron Microscopy Methods and Protocols; Methods in Molecular Biology,VOLUME 117, HUMANA PRESS, 2011
3. William Croft, Under the microscope A brief history of microscopy, World Scientific Publishing Co. Pte. Ltd., 2006

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Faculty of Biotechnology and Animal Husbandry

Field of study	Biotechnology		
Mode of study	stacjonarna	*Level*	drugi
Graduate's qualification	magister inżynier		
Fields of study	dziedzina nauk ścisłych i przyrodniczych, dziedzina nauk rolniczych, dziedzina nauk inżynieryjno-technicznych		
Academic disciplines	nauki biologiczne (5%), technologia żywności i żywienia (10%), rolnictwo i ogrodnictwo (10%), inżynieria chemiczna (5%), inżynieria materiałowa (10%), zootechnika i rybactwo (60%)		
Educational profile	ogólnoakademicki		
Module			
Course unit	**Bioinformatics**		
Code	BT_2A_S_20/21_BTA-A-D2		
Field of specialisation			
Administering faculty	Katedra Nauk o Zwierzętach Przeżuwających		
ECTS	4,0	*ECTS (forms)*	4,0
Form of course credit	egzamin	*Language*	angielski
Electives		*Elective group*	

Form of instruction	*Cod*	*Semester*	*Hours*	*ECTS*	*Weight*	*Credit*
laboratoria	L	1	30	2,7	0,41	zaliczenie
wykłady	W	1	15	1,3	0,59	egzamin

Leading teacher	Zaborski Daniel (Daniel.Zaborski@zut.edu.pl)
Other teachers	

Prerequisites	
W-1	The knowledge of mathematics, biophysics and biochemistry

Module/course unit objectives	
C-1	Learning about selected biological databases, sequence alignment algorithms, the issues of structural and functional genomics, phylogenetics and structural bioinformatics
C-2	Acquiring the skills at retrieving necessary information from biological databases and using available programs for bioinformatics analyses

Course content divided into various forms of instruction		*Number of hours*
T-L-1	Biological literature databases. PubMed	2
T-L-2	Nucleotide and protein sequence databases. GenBank, GenPept	3
T-L-3	Data retrieval from biological databases. The NCBI databases. The Entrez system	4
T-L-4	PCR primer design. Restriction site analysis. The Primer3 and NebCutter programs	2
T-L-5	Python programming basics	2
T-L-6	Searching nucleotide and protein sequence databases. BLAST	2
T-L-7	Biological sequence analysis using Biopython	2
T-L-8	An introduction to R	2
T-L-9	Microarray data analysis using R and other programs	4
T-L-10	Multiple sequence alignment. Phylogenetic tree construction. The Mega program	4
T-L-11	Protein structural alignment	2
T-L-12	Macromolecule visualization	1
T-W-1	An introduction to bioinformatics. Nucleotide and protein sequence databases. Data formats	2
T-W-2	Databases of protein families and structures	2
T-W-3	Pairwise sequence alignment and sequence database searching	2
T-W-4	Genome sequence analysis. Genome comparisons	2
T-W-5	Phylogenetics and phylogenetic trees	3
T-W-6	Gene expression analysis. Microarray data analysis	2
T-W-7	Selected issues of structural bioinformatics	2

Student workload - forms of activity		*Number of hours*
A-L-1	Taking classes	30

Student workload - forms of activity		*Number of hours*
A-L-2	Preparation for classes	20
A-L-3	Preparation for tests	26
A-L-4	Tests	4
A-W-1	Participation in lectures	15
A-W-2	Studying the issues discussed during the lectures	11
A-W-3	Preparation for the examination	10
A-W-4	Examination	2

Teaching methods / tools	
M-1	Lectures presenting theoretical issues
M-2	Multimedia presentations
M-3	Practical classes using computers

Evaluation methods (F - progressive, P - final)		
S-1	P	Examination
S-2	F	Practical test including classes 1-7
S-3	P	Practical test including classes 8-15

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6, 7 lub 8 PRK	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6 lub 7 umożliwiających uzyskanie kompetencji inżynierskich	Course objectives	Course content	Teaching methods	Evaluation methods
Knowledge							
BT_2A_BTZ-A-D2_W01 A student describes selected biological databases and basic data formats, explains the principles of sequence alignment, characterizes the types of genomic maps and the methods of genome sequencing, assembling, annotating and comparing, names the most important computer programs supporting the above-mentioned processes	BTap_2A_W16	P7S_WG	P7S_WG	C-1	T-W-1 T-W-3 T-W-2 T-W-4	M-1 M-2	S-1
BT_2A_BTZ-A-D2_W02 A student characterizes basic microarray types, their applications and the stages of DNA microarray data analysis, defines the concept of molecular phylogenetics, characterizes the methods of phylogenetic tree building and evaluation, describes the principles of protein secondary structure prediction, names the most important computer programs used in the above-mentioned analyses	BTap_2A_W16	P7S_WG	P7S_WG	C-1	T-W-5 T-W-7 T-W-6	M-1 M-2	S-1
Skills							
BT_2A_BTZ-A-D2_U01 A student can retrieve necessary information from an appropriate biological database, correctly interprets information contained in database records, efficiently uses basic computer programs for biological sequence analysis and basic Python commands	BTap_2A_U02	P7S_UW	P7S_UW	C-2	T-L-1 T-L-3 T-L-2 T-L-5	M-3	S-2
BT_2A_BTZ-A-D2_U02 A student can retrieve data from biological databases, create simple computer programs for nucleic acid sequence analysis, search for similar sequences in databases and align multiple sequences, construct phylogenetic trees based on appropriately selected sequences and interpret such trees	BTap_2A_U02	P7S_UW	P7S_UW	C-2	T-L-6 T-L-10 T-L-7	M-3	S-2 S-3
BT_2A_BTZ-A-D2_U03 A student uses basic R commands and the Bioconductor package for microarray data analysis, identifies differently expressed genes, creates and interprets heatmaps, uses computer programs for macromolecule visualization and protein structural alignments	BTap_2A_U02	P7S_UW	P7S_UW	C-2	T-L-8 T-L-11 T-L-9 T-L-12	M-3	S-3
Social competences							
BT_2A_BTZ-A-D2_K01 A student uses bioinformatics tools for the interpretation of biological phenomena and processes, thus being convinced of their cognizability	BTap_2A_K02	P7S_KK		C-2	T-L-1 T-L-8 T-L-2 T-L-9 T-L-3 T-L-10 T-L-5 T-L-11 T-L-6 T-L-12 T-L-7	M-1 M-2 M-3	S-2 S-3
BT_2A_BTZ-A-D2_K02 A student is aware of the abundance of biological information available in the Internet databases and the increasing importance of bioinformatics tools in the future	BTap_2A_K01	P7S_KK P7S_KO P7S_KR		C-2	T-L-1 T-W-1 T-L-2 T-W-3	M-1 M-2 M-3	S-2
BT_2A_BTZ-A-D2_K03 A student is able to effective individual work based on provided teaching materials and information sources available on the Internet	BTap_2A_K05	P7S_KO P7S_KR		C-2	T-L-1 T-L-8 T-L-2 T-L-9 T-L-3 T-L-10 T-L-5 T-L-11 T-L-6 T-L-12 T-L-7	M-3	S-2 S-3

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Outcomes	Grade	Evaluation criterion
Knowledge		
BT_2A_BTZ-A-D2_W01	*2,0*	
	3,0	A student names selected biological databases, describes the concept of sequence alignment, names the basic programs for sequence database searching, describes the types of genomic maps, genome sequencing methods, genome assembly stages, and genome annotation, briefly characterizes the goals of comparative genomics
	3,5	
	4,0	
	4,5	
	5,0	
BT_2A_BTZ-A-D2_W02	*2,0*	
	3,0	A student names basic microarray types, the stages of DNA microarray data analysis, defines the concept of molecular phylogenetics, briefly characterizes the structure of a phylogenetic tree, the most important methods of phylogenetic tree construction and validation, names and briefly describes the algorithms for protein secondary structure prediction
	3,5	
	4,0	
	4,5	
	5,0	
Skills		
BT_2A_BTZ-A-D2_U01	*2,0*	
	3,0	A student uses basic tools for searching selected biological databases, interprets information contained in GenBank records, uses basic options of computer programs for biological sequence analysis and basic Python commands
	3,5	
	4,0	
	4,5	
	5,0	
BT_2A_BTZ-A-D2_U02	*2,0*	
	3,0	A student uses basic Biopython commands for creating simple scripts for nucleic acid sequence analysis, uses basic options of the BLAST and Clustal programs for database searching and multiple sequence alignment, can construct phylogenetic trees and interpret them
	3,5	
	4,0	
	4,5	
	5,0	
BT_2A_BTZ-A-D2_U03	*2,0*	
	3,0	A student uses basic R commands, can import and export data in R, create R scripts, preprocess microarray data, identify differently expressed genes using appropriate statistical methods, create heatmaps and interpret them
	3,5	
	4,0	
	4,5	
	5,0	
Other social competences		
BT_2A_BTZ-A-D2_K01	*2,0*	
	3,0	
	3,5	
	4,0	
	4,5	
	5,0	
BT_2A_BTZ-A-D2_K02	*2,0*	
	3,0	
	3,5	
	4,0	
	4,5	
	5,0	
BT_2A_BTZ-A-D2_K03	*2,0*	
	3,0	
	3,5	
	4,0	
	4,5	
	5,0	

Required reading

1. Xiong J., Essential Bioinformatics, Cambridge University Press., Cambridge, 2006

2. Higgs P. G., Attwood T. K., Bioinformatics and Molecular Evolution, Blackwell Science Ltd., Oxford., 2005

Required reading
3. Baxervanis A. D., Ouellette B. F. F. (red.), Bioinformatics. A Practical Guide to the Analysis of Genes and Proteins, John Wiley & Sons, Inc., New York, 2001

Supplementary reading
1. Hall B. G., Phylogenetic Trees Made Easy. A How-to-Manual, Sinauer Associates, Inc., Sunderland, MA, 2008
2. Westhead D. R., Parish J. H., Twyman R. M., Bioinformatics. Instant Notes, Taylor & Francis, London & New York, 2002

Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Faculty of Biotechnology and Animal Husbandry

Field of study	Biotechnology		
Mode of study	stacjonarna	*Level*	drugi
Graduate's qualification	magister inżynier		
Fields of study	dziedzina nauk ścisłych i przyrodniczych, dziedzina nauk rolniczych, dziedzina nauk inżynieryjno-technicznych		
Academic disciplines	nauki biologiczne (5%), technologia żywności i żywienia (10%), rolnictwo i ogrodnictwo (10%), inżynieria chemiczna (5%), inżynieria materiałowa (10%), zootechnika i rybactwo (60%)		
Educational profile	ogólnoakademicki		
Module			
Course unit	**Social communication and negotiation techniques**		
Code	BT_2A_S_20/21_BTA-A-O8.1		
Field of specialisation			
Administering faculty	Studium Nauk Humanistycznych i Pedagogicznych		
ECTS	1,0	*ECTS (forms)*	1,0
Form of course credit	zaliczenie	*Language*	angielski
Electives	8	*Elective group*	

Form of instruction	*Cod*	*Semester*	*Hours*	*ECTS*	*Weight*	*Credit*
wykłady	W	1	15	1,0	1,00	zaliczenie

Leading teacher	Zychowicz Marzena (Marzena-Zychowicz@zut.edu.pl)
Other teachers	Zienkiewicz Dariusz (Dariusz.Zienkiewicz@zut.edu.pl), Zychowicz Marzena (Marzena-Zychowicz@zut.edu.pl)

Prerequisites

W-1	General knowledge of society.

Module/course unit objectives

C-1	Acquiring interpersonal relationships effectiveness based on basic knowledge of social psychology.
C-2	Theoretical and practical recognizing persuasive influence as a form of influencing people.

Course content divided into various forms of instruction		*Number of hours*
T-W-1	Social communication basics, its goals and conditions	2
T-W-2	Social communication basics, its goals and conditions	2
T-W-3	Negotiator – set of attributes and skills	1
T-W-4	Lobbyists- strategies, methods, forms and operating devices.	1
T-W-5	Basic interpersonal relations skills. Rules of a correct conversation.	2
T-W-6	Self-presentation techniques, public appearances preparation.	2
T-W-7	Non-verbal communication, mimics, gestures, proxemics.	2
T-W-8	Basic skills helping to manage stressful situations and negotiations	2
T-W-9	Negotiations as a mean of solving conflicts.	1

Student workload - forms of activity		*Number of hours*
A-W-1	Attendance	15
A-W-2	Preparation of a presentation on chosen topic.	5
A-W-3	Meritorical preparation for lectures.	5
A-W-4	Preparation for completing the course.	5

Teaching methods / tools

M-1	Information lecture
M-2	Conversational lecture
M-3	Problem-focused lecture
M-4	Multimedia presentation

Evaluation methods (F - progressive, P - final)

S-1	F	Topic speech/presentation
S-2	F	Meritorical activity.

Evaluation methods (F - progressive, P - final)		
S-3	P	Final conversation.

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6, 7 lub 8 PRK	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6 lub 7 umożliwiających uzyskanie kompetencji inżynierskich	Course objectives	Course content	Teaching methods	Evaluation methods
Knowledge							
BT_2A_BTZ-A-O8.1_W01 The student is familiar with persuasive communication’s rules of functioning and fields of use.	BTap_2A_W02	P7S_WK	P7S_WK	C-1 C-2	T-W-1 T-W-6 T-W-2 T-W-7 T-W-3 T-W-8 T-W-4 T-W-9 T-W-5	M-1 M-2 M-3 M-4	S-1 S-2 S-3
Skills							
BT_2A_BTZ-A-O8.1_U01 The student is capable of recognizing persuasive communicate among others and applying the persuasive rules in negotiations.	BTap_2A_U01	P7S_UW		C-1 C-2	T-W-1 T-W-6 T-W-2 T-W-7 T-W-3 T-W-8 T-W-4 T-W-9 T-W-5	M-1 M-2 M-3 M-4	S-1 S-2 S-3
Social competences							
BT_2A_BTZ-A-O8.1_K01 The student has both negotiating and persuasive competences, which enhance his or her management skills and effectiveness on the labour market.	BTap_2A_K04 BTap_2A_K06	P7S_KR		C-1 C-2	T-W-1 T-W-6 T-W-2 T-W-7 T-W-3 T-W-8 T-W-4 T-W-9 T-W-5	M-1 M-2 M-3 M-4	S-1 S-2 S-3

Outcomes	Grade	Evaluation criterion
Knowledge		
BT_2A_BTZ-A-O8.1_W01	*2,0*	
	3,0	The student is familiar with persuasive communication’s rules of functioning and fields of use.
	3,5	
	4,0	
	4,5	
	5,0	
Skills		
BT_2A_BTZ-A-O8.1_U01	*2,0*	
	3,0	The student is capable of recognizing persuasive communicate among others and applying the persuasive rules in negotiations.
	3,5	
	4,0	
	4,5	
	5,0	
Other social competences		
BT_2A_BTZ-A-O8.1_K01	*2,0*	
	3,0	The student has both negotiating and persuasive competences, which enhance his or her management skills and effectiveness on the labour market.
	3,5	
	4,0	
	4,5	
	5,0	

Required reading

1. Berne E., W co grają ludzie. Psychologia stosunków międzyludzkich, PWN, Warszawa, 2014

2. Cialdini R., Wywieranie wpływu na ludzi, teoria i praktyka,, GWP, Gdańsk, 2009

3. Hogan K., Psychologia perswazji, Wydawnictwo Czarna Owca, 2010

Supplementary reading

1. Thiel E., Mowa ciała zdradzi więcej niż tysiąc słów, Astrum, Wrocław, 2007

2. Tokarz M., Argumentacja, perswazja, manipulacja. Wykłady z teorii komunikacji., GWP, Gdańsk, 2006

Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Faculty of Biotechnology and Animal Husbandry

Field of study	Biotechnology		
Mode of study	stacjonarna	*Level*	drugi
Graduate's qualification	magister inżynier		
Fields of study	dziedzina nauk ścisłych i przyrodniczych, dziedzina nauk rolniczych, dziedzina nauk inżynieryjno-technicznych		
Academic disciplines	nauki biologiczne (5%), technologia żywności i żywienia (10%), rolnictwo i ogrodnictwo (10%), inżynieria chemiczna (5%), inżynieria materiałowa (10%), zootechnika i rybactwo (60%)		
Educational profile	ogólnoakademicki		
Module			
Course unit	**Sociology of cybersociety**		
Code	BT_2A_S_20/21_BTA-A-O8.2		
Field of specialisation			
Administering faculty	Studium Nauk Humanistycznych i Pedagogicznych		
ECTS	1,0	*ECTS (forms)*	1,0
Form of course credit	zaliczenie	*Language*	angielski
Electives	8	*Elective group*	

Form of instruction	*Cod*	*Semester*	*Hours*	*ECTS*	*Weight*	*Credit*
wykłady	W	1	15	1,0	1,00	zaliczenie

Leading teacher	Zychowicz Marzena (Marzena-Zychowicz@zut.edu.pl)
Other teachers	

Prerequisites	
W-1	General knowledge of society.

Module/course unit objectives	
C-1	Essential aspects of social and economic development, role of technology and the level and form of information exchange characteristics in relation to forming social order.
C-2	Overview and characteristics of information society conception powered by sociological conceptual apparatus

Course content divided into various forms of instruction		*Number of hours*
T-W-1	Fundaments of social order. Civilization and culture. Social structure and social relationships	2
T-W-2	Social and economical formations throughout the history and their relation to the level of technological developments made for fulfilling social needs.	2
T-W-3	Creation and development of mass-culture and its influence on social and political transformations.	2
T-W-4	Oerview and characteristics of information society theories.	2
T-W-5	Influence of information technology development on various social life aspects.	1
T-W-6	Globalization and its effects in relation to information technology development.	1
T-W-7	Social processes and phenomena related to IT technology’s influence on the transformation of individual’s and lifestyle (social stratification, digital divide, netocracy)	1
T-W-8	Threats related to enhancement of new means of communication (identity theft, invigilation, terrorism in web).	2
T-W-9	State and authority in information society.	1
T-W-10	Information society prognoses and challenges.	1

Student workload - forms of activity		*Number of hours*
A-W-1	Attendance.	15
A-W-2	Preparation of a presentation on chosen topic.	5
A-W-3	Meritorical preparation for lectures.	5
A-W-4	Preparation for completing the course.	5

Teaching methods / tools	
M-1	Information lecture
M-2	Conversational lecture
M-3	Problem-focused lecture
M-4	Multimedia presentation

Evaluation methods (F - progressive, P - final)		
S-1	F	Topic speech/presentation.
S-2	F	Meritorical activity.
S-3	P	Final conversation.

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6, 7 lub 8 PRK	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6 lub 7 umożliwiających uzyskanie kompetencji inżynierskich	Course objectives	Course content	Teaching methods	Evaluation methods
Knowledge							
BT_2A_BTZ-A-O8.2_W01 The student is capable of describing and defining terms and content of the subject information society sociology.	BTap_2A_W02	P7S_WK	P7S_WK	C-1 C-2	T-W-1 T-W-6 T-W-2 T-W-7 T-W-3 T-W-8 T-W-4 T-W-9 T-W-5 T-W-10	M-1 M-2 M-3 M-4	S-1 S-2 S-3
Skills							
BT_2A_BTZ-A-O8.2_U01 The student is capable of understanding and analyzing certain social processes and phenomena in information society.	BTap_2A_U01	P7S_UW		C-1 C-2	T-W-1 T-W-6 T-W-2 T-W-7 T-W-3 T-W-8 T-W-4 T-W-9 T-W-5 T-W-10	M-1 M-2 M-3 M-4	S-1 S-2 S-3
Social competences							
BT_2A_BTZ-A-O8.2_K01 The student is capable, adequately to his or her social and professional status, of performing various social roles.	BTap_2A_K04 BTap_2A_K06	P7S_KR		C-1 C-2	T-W-1 T-W-6 T-W-2 T-W-7 T-W-3 T-W-8 T-W-4 T-W-9 T-W-5 T-W-10	M-1 M-2 M-3 M-4	S-1 S-2 S-3

Outcomes	Grade	Evaluation criterion
Knowledge		
BT_2A_BTZ-A-O8.2_W01	*2,0*	
	3,0	The student has basic knowledge in the field of individual's existance in institutions, lobbying. The student is capable of listing all basic terms, but does not show full understanding of them.
	3,5	
	4,0	
	4,5	
	5,0	
Skills		
BT_2A_BTZ-A-O8.2_U01	*2,0*	
	3,0	The student is capable of using elementary information society sociology terms.
	3,5	
	4,0	
	4,5	
	5,0	
Other social competences		
BT_2A_BTZ-A-O8.2_K01	*2,0*	
	3,0	The student is capable of a reflection regarding performed social roles and his or her own aptitude for performing them.
	3,5	
	4,0	
	4,5	
	5,0	

Required reading

1. Castells M., Społeczeństwo sieci, PWN, Warszawa, 2010
2. Białostocki T., Moroz J., Nowina-Konopka M., Zacher L.W., Społeczeństwo informacyjne. Istota, rozwój, wyzwania., Wydawnictwa Akademickie i Profesionalne, 2010
3. Kurczewska J. (red), Wielka sieć. E-seje z socjologii internetu., Trio, Warszawa, 2006
4. Goban-Klas T., Cywilizacja medialna. Geneza, ewulucja, eksplozja., WSIP, Warszawa, 2005

Supplementary reading

1. Hopfinger M. (red), Nowe Media w komunikacji społecznej w XX wieku., Oficyna Naukowa, Warszawa, 2002
2. Darin B., Społeczeństwo sieci, SIC, 2008
3. Szewczyk A. (red.), Dylematy cywilizacji informatycznej., PWN, Warszawa, 2004
4. Papińska-Kacperek J., Społeczeństwo informacyjne, PWN, Warszawa, 2008
5. Okólski M., Fihel A., Demografia. Współczesne zjawiska i teorie., Warszawa, 2012

Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Faculty of Biotechnology and Animal Husbandry

Field of study	Biotechnology		
Mode of study	stacjonarna	*Level*	drugi
Graduate's qualification	magister inżynier		
Fields of study	dziedzina nauk ścisłych i przyrodniczych, dziedzina nauk rolniczych, dziedzina nauk inżynieryjno-technicznych		
Academic disciplines	nauki biologiczne (5%), technologia żywności i żywienia (10%), rolnictwo i ogrodnictwo (10%), inżynieria chemiczna (5%), inżynieria materiałowa (10%), zootechnika i rybactwo (60%)		
Educational profile	ogólnoakademicki		
Module			
Course unit	**Lobbing in public life**		
Code	BT_2A_S_20/21_BTA-A-O8.3		
Field of specialisation			
Administering faculty	Studium Nauk Humanistycznych i Pedagogicznych		
ECTS	1,0	*ECTS (forms)*	1,0
Form of course credit	zaliczenie	*Language*	angielski
Electives	8	*Elective group*	

Form of instruction	*Cod*	*Semester*	*Hours*	*ECTS*	*Weight*	*Credit*
wykłady	W	1	15	1,0	1,00	zaliczenie

Leading teacher	Zychowicz Marzena (Marzena-Zychowicz@zut.edu.pl)
Other teachers	

Prerequisites

W-1	General knowledge of society.

Module/course unit objectives

C-1	Familiarity with basic terms regarding lobbying, its forms and mechanisms along with its influence on the economy and social life.
C-2	Familiarity with basic terms regarding lobbying, its forms and mechanisms along with its influence on the economy and social life.

Course content divided into various forms of instruction		*Number of hours*
T-W-1	Etymology, definitions, content and range of the phenomenon	2
T-W-2	Evolution of content and form of lobbying from ancient to modern time.	2
T-W-3	Legal and ethical lobbying regulations. Lobbying compared to other influencing methods.	2
T-W-4	Lobbyists- strategies, methods, forms and operating devices.	3
T-W-5	Models and forms of lobbying in certain countries (USA, Canada, United Kingdom, Germany, Austria, France).	2
T-W-6	Lobbying in Poland – actors, roles, forms and effects.	2
T-W-7	Lobbying regulations and practices in the European Union. Fields and forms of Poland-EU lobbying.	2

Student workload - forms of activity		*Number of hours*
A-W-1	Attendance.	15
A-W-2	Meritorical preparation for lectures, literature analysis.	15

Teaching methods / tools

M-1	Conversational lecture.
M-2	Informational lecture.
M-3	Problem-focused lecture

Evaluation methods (F - progressive, P - final)

S-1	F	Meritorical activity during lectures
S-2	P	Final test.

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6, 7 lub 8 PRK	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6 lub 7 umożliwiających uzyskanie kompetencji inżynierskich	Course objectives	Course content	Teaching methods	Evaluation methods

Knowledge							
BT_2A_BTZ-A-O8.3_W01 The student is familiar with lobbying terminology and problems.	BTap_2A_W02	P7S_WK	P7S_WK	C-1 C-2	T-W-1 T-W-5 T-W-2 T-W-6 T-W-3 T-W-7 T-W-4	M-1 M-2 M-3	S-1 S-2
Skills							
BT_2A_BTZ-A-O8.3_U01 The student is able to identify fields of acting of various subjects as lobbying actions and other forms of influence.	BTap_2A_U01	P7S_UW		C-1 C-2	T-W-1 T-W-5 T-W-2 T-W-6 T-W-3 T-W-7 T-W-4	M-1 M-2 M-3	S-1 S-2
Social competences							
BT_2A_BTZ-A-O8.3_K01 The student has competences in the field of lobbying legal and ethical behaviors in relation to further professional work.	BTap_2A_K04 BTap_2A_K06	P7S_KR		C-1 C-2	T-W-1 T-W-5 T-W-2 T-W-6 T-W-3 T-W-7 T-W-4	M-1 M-2 M-3	S-1

Outcomes	Grade	Evaluation criterion
Knowledge		
BT_2A_BTZ-A-O8.3_W01	*2,0*	
	3,0	The student has basic knowledge in the field of individual's existence in institutions, lobbying. The student is capable of listing all basic terms, but does not show full understanding of them.
	3,5	
	4,0	
	4,5	
	5,0	
Skills		
BT_2A_BTZ-A-O8.3_U01	*2,0*	
	3,0	The student is capable of listing basic types of lobbying behaviour but he or she can only perform their fragmentary analysis
	3,5	
	4,0	
	4,5	
	5,0	
Other social competences		
BT_2A_BTZ-A-O8.3_K01	*2,0*	
	3,0	The student has general but superficial knowledge in terms of cooperation and lobbying relationships.
	3,5	
	4,0	
	4,5	
	5,0	

Required reading

1. Clamen M., Lobbing i jego sekrety, Felberg SA, Warszawa, 2005
2. Jasiecki K., Molęda-Zdziech M., Kurczewska U., Lobbing, Kraków, 2002

Supplementary reading

1. Kurczewska U., Molęda-Zdziech M., Lobbing w Unii Europejskiej, ISP, Warszawa, 2002
2. Michałowska-Gorywoda K., Podejmowanie decyzji w Unii Europejskiej, Scholar, Warszawa, 2002

Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Faculty of Biotechnology and Animal Husbandry

Field of study	Biotechnology		
Mode of study	stacjonarna	*Level*	drugi
Graduate's qualification	magister inżynier		
Fields of study	dziedzina nauk ścisłych i przyrodniczych, dziedzina nauk rolniczych, dziedzina nauk inżynieryjno-technicznych		
Academic disciplines	nauki biologiczne (5%), technologia żywności i żywienia (10%), rolnictwo i ogrodnictwo (10%), inżynieria chemiczna (5%), inżynieria materiałowa (10%), zootechnika i rybactwo (60%)		
Educational profile	ogólnoakademicki		
Module			
Course unit	**Business ethic**		
Code	BT_2A_S_20/21_BTA-A-O8.4		
Field of specialisation			
Administering faculty	Studium Nauk Humanistycznych i Pedagogicznych		
ECTS	1,0	*ECTS (forms)*	1,0
Form of course credit	zaliczenie	*Language*	angielski
Electives	8	*Elective group*	

Form of instruction	*Cod*	*Semester*	*Hours*	*ECTS*	*Weight*	*Credit*
wykłady	W	1	15	1,0	1,00	zaliczenie

Leading teacher	Dydycz Bożena (Bozena.Dydycz@zut.edu.pl)
Other teachers	

Prerequisites

W-1	Basic knowledge of philosophy

Module/course unit objectives

C-1	Familiarity with locating morality among other interpersonal relationship regulators. Familiarity with basic terms regarding business ethics.

Course content divided into various forms of instruction		*Number of hours*
T-W-1	Ethics as a knowledge discipline. Business ethics specificity- basic terms, attitudes, problems.	3
T-W-2	Typical business ethics approaches according to regional, religious cultural and philosophical orientations.	2
T-W-3	Ethics traditions regarding moral business problems- Christianity, Kant’s test and utilitarian test.	2
T-W-4	Basic values display in economical life- society’s and individual responsibility	2
T-W-5	Responsibility relations on company level – employee perspective, managerial perspective.	2
T-W-6	Ethical aspect of company’s functioning – company’s social environment; positive competition rules, advertising ethics, company ethic codes.	2
T-W-7	Ethical negotiation rules. Problem of social engineering manipulations in moral values sphere.	2

Student workload - forms of activity		*Number of hours*
A-W-1	Attendance	15
A-W-2	Studying literature before conversational lecture.	5
A-W-3	Preparing and writing an essay	10

Teaching methods / tools

M-1	Informational lecture.
M-2	Problem-focused lecture
M-3	Conversational lecture.

Evaluation methods (F - progressive, P - final)

S-1	F	Meritorical activity (literature familiarity) during conversational lecture
S-2	P	Grade based on student’s ability to consider problem related terms based on the written essay.

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6, 7 lub 8 PRK	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6 lub 7 umożliwiających uzyskanie kompetencji inżynierskich	Course objectives	Course content	Teaching methods	Evaluation methods

Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Faculty of Biotechnology and Animal Husbandry

Knowledge							
BT_2A_BTZ-A-O8.4_W01 The student is familiar with basic business ethics terminology and problems.	BTap_2A_W02	P7S_WK	P7S_WK	C-1	T-W-1 T-W-5 T-W-2 T-W-6 T-W-3 T-W-7 T-W-4	M-1 M-2 M-3	S-1 S-2
Skills							
BT_2A_BTZ-A-O8.4_U01 The student has the ability to interpret ethical programs and ethical codes in relation to professional activity.	BTap_2A_U01	P7S_UW		C-1	T-W-1 T-W-5 T-W-2 T-W-6 T-W-3 T-W-7 T-W-4	M-1 M-2 M-3	S-1 S-2
Social competences							
BT_2A_BTZ-A-O8.4_K01 the student is competent in the field of identifying ethical dilemmas and responsible solving them in both personal and professional spheres.	BTap_2A_K04 BTap_2A_K06	P7S_KR		C-1	T-W-1 T-W-5 T-W-2 T-W-6 T-W-3 T-W-7 T-W-4	M-1 M-2 M-3	S-1 S-2

Outcomes	Grade	Evaluation criterion
Knowledge		
BT_2A_BTZ-A-O8.4_W01	*2,0*	
	3,0	the student is familiar with basic business ethics problems and terminology.
	3,5	
	4,0	
	4,5	
	5,0	
Skills		
BT_2A_BTZ-A-O8.4_U01	*2,0*	
	3,0	the student has the ability to identify strictly ethical issues from company programs and codes.
	3,5	
	4,0	
	4,5	
	5,0	
Other social competences		
BT_2A_BTZ-A-O8.4_K01	*2,0*	
	3,0	student’s individual ethic standards influence his or her interpersonal relationships.
	3,5	
	4,0	
	4,5	
	5,0	

Required reading

1. Dietl J., Gasparski W., Etyka biznesu, PWN, Warszawa, 2002
2. Chrysides G. D., Kaler J. H., Wprowadzenie do etyki biznesu, PWN, Warszawa, 1999
3. Sternberg E., Czysty biznes, etyka biznesu w działaniu, PWN, Warszawa, 1998

Supplementary reading

1. Zwoliński A., Etyka bogacenia, Wydawnictwo WAM, Kraków, 2002
2. Blanchard K., Peale N. V., Etyka biznesu, Studio Emka, 2008
3. Porter M. E., Prahalad C. K., Społeczna odpowiedzialność przedsiębiorstw, Wydawnictwo Helion, 2007

Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Faculty of Biotechnology and Animal Husbandry

Field of study	Biotechnology		
Mode of study	stacjonarna	*Level*	drugi
Graduate's qualification	magister inżynier		
Fields of study	dziedzina nauk ścisłych i przyrodniczych, dziedzina nauk rolniczych, dziedzina nauk inżynieryjno-technicznych		
Academic disciplines	nauki biologiczne (5%), technologia żywności i żywienia (10%), rolnictwo i ogrodnictwo (10%), inżynieria chemiczna (5%), inżynieria materiałowa (10%), zootechnika i rybactwo (60%)		
Educational profile	ogólnoakademicki		
Module			
Course unit	**Bioethics**		
Code	BT_2A_S_20/21_BTA-A-O8.5		
Field of specialisation			
Administering faculty	Studium Nauk Humanistycznych i Pedagogicznych		
ECTS	1,0	*ECTS (forms)*	1,0
Form of course credit	zaliczenie	*Language*	angielski
Electives	8	*Elective group*	

Form of instruction	*Cod*	*Semester*	*Hours*	*ECTS*	*Weight*	*Credit*
wykłady	W	1	15	1,0	1,00	zaliczenie

Leading teacher	Zienkiewicz Dariusz (Dariusz.Zienkiewicz@zut.edu.pl)
Other teachers	

Prerequisites

W-1	Students are familiar with basic ethical terms regarding ethical systems, manners of evaluation, moral judgments and ethical models.

Module/course unit objectives

C-1	The course's objective is to make students familiar with dilemmas resulting from searching for moral judgments for making decisions regarding health and life promotion and protection in relation to the development of biological and medical sciences.

Course content divided into various forms of instruction		*Number of hours*
T-W-1	Search for new ethic and propositions of environment ethics in relation to the development of biomedical sciences. History, manners of defining bioethics, disciplinary character and controversies related with discipline.	3
T-W-2	Bioethical standards in international documents and law. Fundamental bioethical documents. Bioethical doctrine of the Church- "Humane vitae", "Evangelium vitae", declarations. Human rights - Universal Declaration on Bioethics and Human Rights, European Convention on Human Rights, European Bioethics Convention.	3
T-W-3	– Health and life promotion and protection – modern development tendencies and threats. Medical experiments, ambits of medical therapy, medical errors. Hopes and threats of medical engineering.	3
T-W-4	Moral problems of contraception, artificial impregnation, prenatal diagnosis and abortion.	2
T-W-5	Problems of modern palliative care. Search of decent death, attitudes towards death, ambits of fighting suffering, euthanasia, rights of a dying man. Legal and neurological status of death in the context of transplantology. Moral judgment of capital punishment and suicide.	3
T-W-6	Final test	1

Student workload - forms of activity		*Number of hours*
A-W-1	Attendance	15
A-W-2	Meritorical preparation to the lecture – topic-related recommended literature analysis.	5
A-W-3	Meritorical preparation to the lecture – topic-related recommended literature analysis.	5
A-W-4	Group preparation of a solution to a certain bioethical problem.	5

Teaching methods / tools

M-1	Informational lecture.
M-2	Problem-focused lecture with situation game elements
M-3	Multimedia presentation with description elements.
M-4	Conversational lecture with elements of discussion.

Evaluation methods (F - progressive, P - final)

Evaluation methods (F - progressive, P - final)		
S-1	F	Meritorical activity- intellectual, verbal and practical (project preparation).
S-2	P	Final conversation regarding passing the written assignment.

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6, 7 lub 8 PRK	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6 lub 7 umożliwiających uzyskanie kompetencji inżynierskich	Course objectives	Course content	Teaching methods	Evaluation methods
Knowledge							
BT_2A_BTZ-A-O8.5_W01 the student is familiar with and understands life and health related processes and dilemmas resulting from them.	BTap_2A_W02	P7S_WK	P7S_WK	C-1	T-W-1 T-W-4 T-W-2 T-W-5 T-W-3	M-1 M-2 M-3 M-4	S-1 S-2
BT_2A_BTZ-A-O8.5_W02 the student is familiar with the rules regarding the preparation of the research, research techniques and devices not only within the studied science discipline, but also considering the bioethical aspects.	BTap_2A_W02	P7S_WK	P7S_WK	C-1	T-W-1 T-W-4 T-W-2 T-W-5 T-W-3	M-1 M-2 M-3 M-4	S-1 S-2
Skills							
BT_2A_BTZ-A-O8.5_U01 the student has the ability of critical analysis and selection of information, which enables him to phrase justified judgments defending his or her attitude regarding certain bioethical phenomena.	BTap_2A_U01	P7S_UW		C-1	T-W-1 T-W-4 T-W-2 T-W-5 T-W-3	M-1 M-2 M-3 M-4	S-1 S-2
BT_2A_BTZ-A-O8.5_U02 the student is able point the most important bioethics dilemmas through speeches and papers.	BTap_2A_U01	P7S_UW		C-1	T-W-1 T-W-4 T-W-2 T-W-5 T-W-3	M-1 M-2 M-3 M-4	S-1 S-2
Social competences							
BT_2A_BTZ-A-O8.5_K01 the student is able to set priorities for realizing a self-set task or a task set by others in relation to bioethical resolutions.	BTap_2A_K04 BTap_2A_K06	P7S_KR		C-1	T-W-1 T-W-4 T-W-2 T-W-5 T-W-3	M-1 M-2 M-3 M-4	S-1
BT_2A_BTZ-A-O8.5_K02 the student is prepared for proper identification and resolving dilemmas regarding the profession through familiarity with various, including bioethical, means of judgment	BTap_2A_K04 BTap_2A_K06	P7S_KR		C-1	T-W-1 T-W-4 T-W-2 T-W-5 T-W-3	M-1 M-2 M-3 M-4	S-1 S-2

Outcomes	Grade	Evaluation criterion
Knowledge		
BT_2A_BTZ-A-O8.5_W01	*2,0*	
	3,0	The student has basic knowledge on the complexity of life and health related phenomena and their ethical correlations, but does not understand the correlations themselves (the basic knowledge cosists of definitions and the most important bioethical processes and phenomena.
	3,5	
	4,0	
	4,5	
	5,0	
BT_2A_BTZ-A-O8.5_W02	*2,0*	
	3,0	The student knows some of the rules of planning the research in relation to honesty and responsibility. He or she cannot, however, always explain the necessity of following them.
	3,5	
	4,0	
	4,5	
	5,0	
Skills		
BT_2A_BTZ-A-O8.5_U01	*2,0*	
	3,0	The student can, in most cases, perform a critical analysis and selection of information in the field discussed but cannot make use of them in order to express logically correct judgements.
	3,5	
	4,0	
	4,5	
	5,0	
BT_2A_BTZ-A-O8.5_U02	*2,0*	
	3,0	The student is capable of identifying some of the bioethics' dilemmas in a practical situation.
	3,5	
	4,0	
	4,5	
	5,0	

Other social competences		
BT_2A_BTZ-A-O8.5_K01	*2,0*	
	3,0	The student makes use of judgment criteria in order to perform actions but succumbs to stereotypes when formulating actions priority in relation to bioethics or ignores them completely.
	3,5	
	4,0	
	4,5	
	5,0	
BT_2A_BTZ-A-O8.5_K02	*2,0*	
	3,0	The student knows methods of valuation, which enables him or her proper identification of the majority of ethical dilemmas related to performing the profession but has difficulties judging them.
	3,5	
	4,0	
	4,5	
	5,0	

Required reading

1. Singer P.,Viens A.M, The Cambridge Textbook of Bioethics, Cambridge University Press, 2008

2. Beauchamp Tom L, Childress James F, Principles of Biomedical Ethics, Oxford University Press, Oxford, 2013

Supplementary reading

1. Post Stephen Garrard, Encyclopedia of bioethics, Macmillan Reference, New York, 2004

2. Viafora Corrado, Dell'Oro Roberto, History of Bioethics: International Perspectives, Intl Scholars Pubns, San Francisco, 1996

Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Faculty of Biotechnology and Animal Husbandry

Field of study	Biotechnology		
Mode of study	stacjonarna	*Level*	drugi
Graduate's qualification	magister inżynier		
Fields of study	dziedzina nauk ścisłych i przyrodniczych, dziedzina nauk rolniczych, dziedzina nauk inżynieryjno-technicznych		
Academic disciplines	nauki biologiczne (5%), technologia żywności i żywienia (10%), rolnictwo i ogrodnictwo (10%), inżynieria chemiczna (5%), inżynieria materiałowa (10%), zootechnika i rybactwo (60%)		
Educational profile	ogólnoakademicki		
Module			
Course unit	**Professional ethics**		
Code	BT_2A_S_20/21_BTA-A-O8.6		
Field of specialisation			
Administering faculty	Studium Nauk Humanistycznych i Pedagogicznych		
ECTS	1,0	*ECTS (forms)*	1,0
Form of course credit	zaliczenie	*Language*	angielski
Electives	8	*Elective group*	

Form of instruction	*Cod*	*Semester*	*Hours*	*ECTS*	*Weight*	*Credit*
wykłady	W	1	15	1,0	1,00	zaliczenie

Leading teacher	Dydycz Bożena (Bozena.Dydycz@zut.edu.pl)
Other teachers	Dydycz Bożena (Bozena.Dydycz@zut.edu.pl)

Prerequisites	
W-1	Basic knowledge of philosophy

Module/course unit objectives	
C-1	Ability to recognize layers of moral conflicts related to general business and economical activity.
C-2	Own reflection in relation to readiness to make moral choices in the context of profession-related performed social roles.

Course content divided into various forms of instruction		*Number of hours*
T-W-1	Ethics as a knowledge discipline. Business Chosen ethical conceptions from antiquity to modern times.	3
T-W-2	Conceptions of individual’s moral development. Conceptions of responsibility.	2
T-W-3	Uniqueness of professional ethics issues in relation to general ethics. Issue of ethical codes of various professions– pros and cons of code-based judgment of ethical issues.	3
T-W-4	Appearance of basic values in economic life society and individual responsibility	2
T-W-5	Responsibility relations on company level – employee perspective, managerial perspective	3
T-W-6	Ethical aspect of company’s functioning – company’s social environment; positive competition rules, advertising ethics, company ethic codes.	1
T-W-7	Ethical negotiation rules. Problem of social engineering manipulations in moral values sphere.	1

Student workload - forms of activity		*Number of hours*
A-W-1	Attendance	15
A-W-2	Studying literature before conversational lecture.	5
A-W-3	Preparing and writing an essay.	10

Teaching methods / tools	
M-1	Informational lecture.
M-2	Problem-focused lecture.
M-3	Conversational lecture.

Evaluation methods (F - progressive, P - final)		
S-1	F	Meritorical activity (literature familiarity) during conversational lecture.
S-2	P	Grade based on student’s ability to consider problem related terms based on the written essay.

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6, 7 lub 8 PRK	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6 lub 7 umożliwiających uzyskanie kompetencji inżynierskich	Course objectives	Course content	Teaching methods	Evaluation methods

Knowledge							
BT_2A_BTZ-A-O8.6_W01 The student is familiar with basic business ethics terminology and problems.	BTap_2A_W02	P7S_WK	P7S_WK	C-1 C-2	T-W-1 T-W-5 T-W-2 T-W-6 T-W-3 T-W-7 T-W-4	M-1 M-2 M-3	S-1 S-2
Skills							
BT_2A_BTZ-A-O8.6_U01 The student has the ability to interpret ethical programs and ethical codes in relation to professional activity.	BTap_2A_U01	P7S_UW		C-1 C-2	T-W-1 T-W-5 T-W-2 T-W-6 T-W-3 T-W-7 T-W-4	M-1 M-2 M-3	S-1 S-2
Social competences							
BT_2A_BTZ-A-O8.6_K01 the student is competent in the field of identifying ethical dilemmas and responsible solving them in both personal and professional spheres.	BTap_2A_K04 BTap_2A_K06	P7S_KR		C-1 C-2	T-W-1 T-W-5 T-W-2 T-W-6 T-W-3 T-W-7 T-W-4	M-1 M-2 M-3	S-1 S-2

Outcomes	Grade	Evaluation criterion
Knowledge		
BT_2A_BTZ-A-O8.6_W01	*2,0*	
	3,0	the student is familiar with basic business ethics problems and terminology.
	3,5	
	4,0	
	4,5	
	5,0	
Skills		
BT_2A_BTZ-A-O8.6_U01	*2,0*	
	3,0	the student has the ability to identify strictly ethical issues from company programs and codes.
	3,5	
	4,0	
	4,5	
	5,0	
Other social competences		
BT_2A_BTZ-A-O8.6_K01	*2,0*	
	3,0	student’s individual ethic standards influence his or her interpersonal relationships.
	3,5	
	4,0	
	4,5	
	5,0	

Required reading

1. Dietl J. Gasparski W., Etyka biznesu, PWN, Warszawa, 2002

2. Chrysides G.D., Kaler J.H., Wprowadzenie do etyki biznesu, PWN, Warszawa, 1999

3. Sternberg E.,, Czysty biznes, etyka biznesu w działaniu, PWN, Warszawa, 1998

Supplementary reading

1. Zwoliński A., Etyka bogacenia, Wydawnictwo WAM, Kraków, 2002

2. Blanchard K., Peale N.V., Etyka biznesu, Studio Emka, 2008

3. Porter M.E., Prahalad C.K., Społeczna odpowiedzialność przedsiębiorstw, Wydawnictwo Helion, 2007

Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Faculty of Biotechnology and Animal Husbandry

Field of study	Biotechnology		
Mode of study	stacjonarna	*Level*	drugi
Graduate's qualification	magister inżynier		
Fields of study	dziedzina nauk ścisłych i przyrodniczych, dziedzina nauk rolniczych, dziedzina nauk inżynieryjno-technicznych		
Academic disciplines	nauki biologiczne (5%), technologia żywności i żywienia (10%), rolnictwo i ogrodnictwo (10%), inżynieria chemiczna (5%), inżynieria materiałowa (10%), zootechnika i rybactwo (60%)		
Educational profile	ogólnoakademicki		
Module			
Course unit	**Basics of information science**		
Code	BT_2A_S_20/21_BTA-S-A1		
Field of specialisation			
Administering faculty	Biblioteka Główna		
ECTS	0,0	*ECTS (forms)*	0,0
Form of course credit	zaliczenie	*Language*	polski
Electives		*Elective group*	

Form of instruction	*Cod*	*Semester*	*Hours*	*ECTS*	*Weight*	*Credit*
wykłady	W	1	2	0,0	1,00	zaliczenie

Leading teacher	Chyła-Czarnecka Anna (Anna.Czarnecka@zut.edu.pl)
Other teachers	Jankowska Elżbieta (Elzbieta.Jankowska@zut.edu.pl), Narloch Anna (Anna.Narloch@zut.edu.pl)

Prerequisites

W-1	Znajomość obsługi komputera i sieci WWW.

Module/course unit objectives

C-1	Student poznaje bazy, serwisy informacyjne oraz katalogi biblioteczne, w których może poszukiwać materiałów do pracy dyplomowej. Poznaje techniki i sposoby formułowania zapytań i przeszukiwania zasobów baz. Dowiaduje sie jak dotrzeć do pełnych tekstów czasopism jeśli są dostępne w ramach Open Access lub w zasobach ZUT oraz dowiaduje się, że z licencyjnych baz danych może korzystać poprzez VPN również z komputerów spoza sieci ZUT. Będzie potrafił sporządzić wykaz wykorzystanej literatury samodzielnie lub przy wykorzystaniu dostępnych programów. Pozna aspekty etyczne pracy naukowej oraz podstawy prawa autorskiego.

Course content divided into various forms of instruction		*Number of hours*
T-W-1	1. System informacyjno-biblioteczny ZUT 2. Źródła informacji naukowej: - bazy bibliograficzno-abstraktowe - serwisy pełnotekstowe książek i czasopism – polskie i zagraniczne, dziedzinowe, multidyscyplinarne - informacja patentowa 3. Dostęp do baz licencyjnych spoza sieci ZUT: - hasła i kody dostępu - VPN – wirtualna siec prywatna 4. Wypożyczenia międzybiblioteczne 5. Zasoby bibliotek Szczecina i regionu (RoKaBiSz – rozproszony katalog bibliotek Szczecina, ZBC – Zachodniopomorska Biblioteka Cyfrowa „Pomerania”) 6. Bibliografia załącznikowa, przypisy bibliograficzne 7. Programy do tworzenia bibliografii załącznikowych (menadżery bibliografii) 8. Praktyczne wyszukiwanie informacji w bazach 9. Baza publikacji pracowników naukowych ZUT 10. Plagiat, prawo autorskie (podstawy)	2

Student workload - forms of activity		*Number of hours*
A-W-1	Uczestnictwo w wykładzie	2

Teaching methods / tools

M-1	Wykład informacyjny

Evaluation methods (F - progressive, P - final)

S-1	P	zaliczenie na podstawie obecności

Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Faculty of Biotechnology and Animal Husbandry

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6, 7 lub 8 PRK	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6 lub 7 umożliwiających uzyskanie kompetencji inżynierskich	Course objectives	Course content	Teaching methods	Evaluation methods
Knowledge							
BTap_2A_BTA-S-A1_W01 Student zna bazy, serwisy informacyjne oraz katalogi biblioteczne, w których może poszukiwać materiałów do pracy dyplomowej. Zna techniki i sposoby formułowania zapytań i przeszukiwania zasobów baz. Wie, że pełne teksty elektronicznych czasopism mogą być dostępne w ramach Open Access lub w licencyjnych zasobach ZUT. Wie, że z licencyjnych baz danych może korzystać poprzez VPN również z komputerów spoza sieci ZUT. Zna zasady sporządzania wykazów wykorzystanej literatury. Jest świadom aspektów etycznych pracy naukowej – zna podstawy prawa autorskiego.	BTap_2A_W02	P7S_WK	P7S_WK	C-1	T-W-1	M-1	S-1
Skills							
BTap_2A_BTA-S-A1_U01 Student umie wybrać odpowiednie bazy, serwisy informacyjne oraz katalogi biblioteczne, w których może poszukiwać materiałów do pracy dyplomowej. Umie zastosować techniki i sposoby formułowania zapytań i przeszukiwania zasobów baz. Umie dotrzeć do pełnych tekstów elektronicznych czasopism, które mogą być dostępne w ramach Open Access lub w licencyjnych zasobach ZUT. Umie korzystać z licencyjnych baz danych poprzez VPN również z komputerów spoza sieci ZUT. Umie sporządzić wykaz wykorzystanej literatury samodzielnie lub przy wykorzystaniu odpowiedniego oprogramowania.	BTap_2A_U09	P7S_UW	P7S_UW	C-1	T-W-1	M-1	S-1
Social competences							
BTap_2A_BTA-S-A1_K01 Potrafi poruszać się w środowisku informacyjnym naukowych baz danych. Rozwija umiejętność komunikacji naukowej. Jest świadom aspektów etycznych pracy naukowej – zna podstawy prawa autorskiego.	BTap_2A_K07	P7S_KO P7S_KR		C-1	T-W-1	M-1	S-1

Outcomes	Grade	Evaluation criterion
Knowledge		
BTap_2A_BTA-S-A1_W01	*2,0*	Nie dotyczy
	3,0	Nie dotyczy
	3,5	Nie dotyczy
	4,0	Nie dotyczy
	4,5	Nie dotyczy
	5,0	Nie dotyczy
Skills		
BTap_2A_BTA-S-A1_U01	*2,0*	Nie dotyczy
	3,0	Nie dotyczy
	3,5	Nie dotyczy
	4,0	Nie dotyczy
	4,5	Nie dotyczy
	5,0	Nie dotyczy
Other social competences		
BTap_2A_BTA-S-A1_K01	*2,0*	Nie dotyczy
	3,0	Nie dotyczy
	3,5	Nie dotyczy
	4,0	Nie dotyczy
	4,5	Nie dotyczy
	5,0	Nie dotyczy

Required reading

1. PN-ISO 690 : 2012. Informacja i dokumentacja – Wytyczne opracowania przypisów bibliograficznych i powołań na zasoby informacji, 2012

2. Mazur-Kulesza K., Wierzbicka-Próchniak D., ABC tworzenia przypisów i bibliografii załącznikowej, SBP Zarząd Okręgu w Opolu, Opole, 2012, http://libra.ibuk.pl/book/42212

Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Faculty of Biotechnology and Animal Husbandry

Field of study	Biotechnology		
Mode of study	stacjonarna	*Level*	drugi
Graduate's qualification	magister inżynier		
Fields of study	dziedzina nauk ścisłych i przyrodniczych, dziedzina nauk rolniczych, dziedzina nauk inżynieryjno-technicznych		
Academic disciplines	nauki biologiczne (5%), technologia żywności i żywienia (10%), rolnictwo i ogrodnictwo (10%), inżynieria chemiczna (5%), inżynieria materiałowa (10%), zootechnika i rybactwo (60%)		
Educational profile	ogólnoakademicki		
Module			
Course unit	**Diploma thesis**		
Code	BT_2A_S_20/21_BTA-A-A6		
Field of specialisation	Biotechnology in animal production and environmental protection		
Administering faculty	Katedra Biotechnologii Rozrodu Zwierząt i Higieny Środowiska		
ECTS	20,0	*ECTS (forms)*	20,0
Form of course credit	zaliczenie	*Language*	angielski
Electives		*Elective group*	

Form of instruction	*Cod*	*Semester*	*Hours*	*ECTS*	*Weight*	*Credit*
praca dyplomowa	PD	3	0	20,0	1,00	zaliczenie

Leading teacher	Stankiewicz Tomasz (Tomasz.Stankiewicz@zut.edu.pl)
Other teachers	

Prerequisites	
W-1	Completion of the library training
W-2	The ability to edit the text
W-3	The knowledge and ability to use statistical methods in biotechnology

Module/course unit objectives	
C-1	Preparing a master thesis. Preparing for a diploma exam.

Course content divided into various forms of instruction		*Number of hours*
T-PD-1	Final reading of diploma thesis and verification of its content	0
T-PD-2	Creating and verifying a presentation showing content of a diploma thesis	0

Student workload - forms of activity		*Number of hours*
A-PD-1	Participation in consultations	280
A-PD-2	Literature analysis given by a thesis supervisor	40
A-PD-3	Searching for additional literature in libraries, scientific journals and on websites	50
A-PD-4	Statistical analysis of results	30
A-PD-5	Writing a diploma thesis	70
A-PD-6	Inputting a corrections	30
A-PD-7	Preparing a thesis for printing	30
A-PD-8	Preparing for diploma exam and the thesis defense	70

Teaching methods / tools	
M-1	Independent work of a student coordinated by a thesis advisor during consultation hours.

Evaluation methods (F - progressive, P - final)		
S-1	F	Continuous assessment of students' work progress during consultation.
S-2	P	Diploma exam and defense of the master thesis.

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6, 7 lub 8 PRK	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6 lub 7 umożliwiających uzyskanie kompetencji inżynierskich	Course objectives	Course content	Teaching methods	Evaluation methods
Knowledge							

BT_2A_BTZ-A-A6_W01 The student knows how to prepere a diploma thesis and how to prepere for diploma exam.	BTap_2A_W11	P7S_WG	P7S_WG	C-1	T-PD-1 T-PD-2	M-1	S-1 S-2
Skills							
BT_2A_BTZ-A-A6_U01 With a little assistance from a thesis supervisor student is able to prepare and present a diploma thesis.	BTap_2A_U09	P7S_UW	P7S_UW	C-1	T-PD-1 T-PD-2	M-1	S-1 S-2
BT_2A_BTZ-A-A6_U02 The student has ability to pass his/hers biotechnological knowledge in an organised and a critical manner.	BTap_2A_U01	P7S_UW		C-1	T-PD-1 T-PD-2	M-1	S-1 S-2
Social competences							
BT_2A_BTZ-A-A6_K01 The student shows a belief about empirical analysis of biological phenomenons based on mathematical and statistical methods.	BTap_2A_K02	P7S_KK		C-1	T-PD-1 T-PD-2	M-1	S-1
BT_2A_BTZ-A-A6_K02 The student shows an open and searching attitude concerning the constant development of his/hers cognitive activities based on scientific souurces of information.	BTap_2A_K01	P7S_KK P7S_KO P7S_KR		C-1	T-PD-1 T-PD-2	M-1	S-1

Outcomes	Grade	Evaluation criterion
Knowledge		
BT_2A_BTZ-A-A6_W01	*2,0*	The student do not possess sufficient knowledge specified for a given field of study and specialty that would enable him/her writing and defending a diploma thesis.
	3,0	The student possesses a knowledge specified for a given specialty and a minimal amount of knowledge related with the field of study enabling him/her writing a diploma thesis in the limited thematic scope, but enough to defend it.
	3,5	The student possesses enough knowledge for a given field of study and specialty enabling him/her a proper writing a diploma thesis and its further defense.
	4,0	The student possesses a good knowledge for a given field of study and specialty enabling him/her a comprehensive writing a diploma thesis and its further proper defense.
	4,5	The student possesses a broad knowledge for a given field of study and specialty enabling him/her a writing a very good diploma thesis and its further goood defense.
	5,0	The student possesses a very broad knowledge for a given field of study and specialty enabling him/her a writing a very good diploma thesis and its further excellent defense.
Skills		
BT_2A_BTZ-A-A6_U01	*2,0*	The student do not possess abilities allowing him/her for writing and editing a scientific work.
	3,0	The student possesses only minimal abilities allowing him/her for writing a proposed diploma theme, he/she participates in research activities, however analysis are peformed exclusevely under supervision of a promoter, he/she keeps a proper thesis layout, is able to properly edit a thesis using a proper scientific literature.
	3,5	
	4,0	
	4,5	
	5,0	
BT_2A_BTZ-A-A6_U02	*2,0*	The student do not possess abilities allowing him/her for writing and editing a scientific work.
	3,0	The student possesses only minimal abilities allowing him/her for writing a proposed diploma theme, he/she participates in research activities, however analysis are peformed exclusevely under supervision of a promoter, he/she keeps a proper thesis layout, is able to properly edit a thesis using a proper scientific literature.
	3,5	
	4,0	
	4,5	
	5,0	
Other social competences		
BT_2A_BTZ-A-A6_K01	*2,0*	The student do not show a belief about empirical analysis of biological phenomenons based on mathematical and statistical methods.
	3,0	The student shows a sufficient belief about empirical analysis of biological phenomenons based on mathematical and statistical methods.
	3,5	
	4,0	
	4,5	
	5,0	
BT_2A_BTZ-A-A6_K02	*2,0*	The student do not show an open and searching attitude concerning the constant development of his/hers cognitive activities based on scientific souurces of information.
	3,0	The student shows a sufficient open and searching attitude concerning the constant development of his/hers cognitive activities based on scientific souurces of information.
	3,5	
	4,0	
	4,5	
	5,0	

Required reading

1. Andrews G., How to write a master's dissertation: outline and examples, Amazon Digital Services LLC, 2017

2. Sahlman P., How to write a masters thesis fast: Practical productivity tips for students, Amazon Digital Services LLC, 2012

Required reading

3. Andrews G., Writing your dissertation literature review: a step-by-step guide (Essay and Thesis Writing Book 8), Amazon Digital Services LLC, 2017

Supplementary reading

1. Andrews G., Academic writing guide: paragraph structure (Essay and Thesis Writing Book 11), Amazon Digital Services LLC, 2017

Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Faculty of Biotechnology and Animal Husbandry

Field of study	Biotechnology		
Mode of study	stacjonarna	*Level*	drugi
Graduate's qualification	magister inżynier		
Fields of study	dziedzina nauk ścisłych i przyrodniczych, dziedzina nauk rolniczych, dziedzina nauk inżynieryjno-technicznych		
Academic disciplines	nauki biologiczne (5%), technologia żywności i żywienia (10%), rolnictwo i ogrodnictwo (10%), inżynieria chemiczna (5%), inżynieria materiałowa (10%), zootechnika i rybactwo (60%)		
Educational profile	ogólnoakademicki		
Module			
Course unit	**Environmental toxicology**		
Code	BT_2A_S_20/21_BTA-A-C2		
Field of specialisation	Biotechnology in animal production and environmental protection		
Administering faculty	Katedra Biotechnologii Rozrodu Zwierząt i Higieny Środowiska		
ECTS	3,0	*ECTS (forms)*	3,0
Form of course credit	zaliczenie	*Language*	angielski
Electives		*Elective group*	

Form of instruction	*Cod*	*Semester*	*Hours*	*ECTS*	*Weight*	*Credit*
ćwiczenia audytoryjne	A	2	15	1,5	0,41	zaliczenie
wykłady	W	2	15	1,5	0,59	zaliczenie

Leading teacher	Tomza-Marciniak Agnieszka (Agnieszka.Tomza-Marciniak@zut.edu.pl)
Other teachers	Pilarczyk Bogumiła (Bogumila.Pilarczyk@zut.edu.pl)

Prerequisites	
W-1	Knowledge of issues related to ecology and environmental protection.

Module/course unit objectives	
C-1	To acquaint students with the toxicological characteristic of selected environmental pollutants.
C-2	To acquaint students with metabolism of toxins.
C-3	To acquaint students with factors influencing toxicity of xenobiotics.
C-4	To acquaint students with the basic mechanisms of functional disorders and morphological changes in selected organs and systems.

Course content divided into various forms of instruction		*Number of hours*
T-A-1	Toxicity testing of xenobiotics. Degrees of toxicity. Dose-response relationship.	4
T-A-2	Bioconcetration, bioaccumulation and biomagnification. Determination of BCF, BSAF and BMF (for different types ecosystems).	2
T-A-3	Toxicological characteristics of metals (Cd, Hg, Pb, Cu, Cr) and metalloid (As, Si). Source of pollution, route of absorption, fate and mechanism of toxicity. MRLs.	2
T-A-4	Estimation of dietary daily intake of toxic elements.	2
T-A-5	Persistent organic pollutants (POPs) - toxicological characteristcs.	2
T-A-6	Estimation of dietary daily intake of selected POPs.	3
T-W-1	Pollution and their fate in aquatic and terrestrial ecosystems. Classes of contaminants. Global transport of pollution. Factors determining the distribution of pollutants in the environment. Models of pollutants spread in the environment.	2
T-W-2	Metabolism of xenobiotics.	2
T-W-3	Factors affecting the toxicity of xenobiotics (the physicochemical properties - dissociation, solubility, particle size, biological factors - age, sex, individual development). Genetic factors versus accumulation and biotransformation of xenobiotics.	2
T-W-4	The biochemical effects of impurities (induction of detoxifying enzymes, and proteins capable of binding to heavy metal inhibition of cholinesterase, endocrine dysfunction, DNA adduct formation). Physiological effects of pollution (osmoregulation disorders, metabolic and neurological). The effects of toxicological interactions (additive effects, toxicity potentiation, antagonism).	2
T-W-5	Mutagenic and carcinogenic effects of xenobiotics. The impact of environmental pollution on the development of cancer. Types of carcinogens (genotoxic - working directly influence the metabolic activation; epigenetic - promoters, cytotoxic compounds, modifiers of hormones, immunosuppressive compounds).	2

Course content divided into various forms of instruction		*Number of hours*
T-W-6	Poisons of animal origin (poisons of insects, snakes, scorpions, fish). Symptoms and mechanism of toxicity.	2
T-W-7	Toxicological characteristics of plastics. Toxicological classification of some preparations used in households.	3

Student workload - forms of activity		*Number of hours*
A-A-1	participation in lectures	15
A-A-2	preparation for test	15
A-A-3	studying indicated literature	15
A-W-1	participation in lectures	15
A-W-2	preparation for test	15
A-W-3	studying indicated literature	15

Teaching methods / tools	
M-1	Delivery method, lecture/presentation
M-2	Discussion
M-3	Explanation

Evaluation methods (F - progressive, P - final)		
S-1	P	test
S-2	F	continuous assessment

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6, 7 lub 8 PRK	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6 lub 7 umożliwiających uzyskanie kompetencji inżynierskich	Course objectives	Course content	Teaching methods	Evaluation methods
Knowledge							
BT_2A_BTZ-A-C2_W01 The student discusses the toxins biotransformation and factors affecting the toxicity of xenobiotics.	BTap_2A_W06 BTap_2A_W12	P7S_WG		C-2	T-W-2 T-W-3	M-1 M-3	S-1
BT_2A_BTZ-A-C2_W02 Student discusses the mechanisms of functional disorders and changes morphological organs and systems under of selected toxins.	BTap_2A_W01	P7S_WG		C-1 C-4	T-W-4 T-W-6 T-W-5	M-1 M-2 M-3	S-1
BT_2A_BTZ-A-C2_W03 Student characterizes of selected xenobiotics.	BTap_2A_W01 BTap_2A_W12	P7S_WG		C-1	T-A-2 T-A-6 T-A-3 T-W-1 T-A-4 T-W-7 T-A-5	M-1 M-2 M-3	S-1
Skills							
BT_2A_BTZ-A-C2_U01 Student is able to calculate the LD50 for a specific subtance with using different methods.	BTap_2A_U05	P7S_UK P7S_UO P7S_UU P7S_UW	P7S_UW	C-1	T-A-1	M-3	S-2
Social competences							
BT_2A_BTZ-A-C2_K01 The student demonstrates an active engagement with solving the identified problems.	BTap_2A_K05	P7S_KO P7S_KR		C-1 C-2 C-3	T-A-1 T-W-2 T-A-2 T-W-3 T-A-3 T-W-4 T-A-4 T-W-5 T-A-5 T-W-6 T-A-6 T-W-7 T-W-1	M-2	S-2

Outcomes	Grade	Evaluation criterion
Knowledge		
BT_2A_BTZ-A-C2_W01	*2,0*	
	3,0	The student describes the fate of toxins in the organism and explains the variability of the toxicity of specified substances.
	3,5	
	4,0	
	4,5	
	5,0	
BT_2A_BTZ-A-C2_W02	*2,0*	
	3,0	Student describes the mechanisms of functional disorders and morphological changes in the organs and systems by the action of selected toxins.
	3,5	
	4,0	
	4,5	
	5,0	

Knowledge		
BT_2A_BTZ-A-C2_W03	*2,0*	
	3,0	Student correctly characterizes most of indicated xenobiotics.
	3,5	
	4,0	
	4,5	
	5,0	
Skills		
BT_2A_BTZ-A-C2_U01	*2,0*	
	3,0	Student is able to calculate the LD50 for a indicated xenobiotic, using as at least 2 methods.
	3,5	
	4,0	
	4,5	
	5,0	
Other social competences		
BT_2A_BTZ-A-C2_K01	*2,0*	
	3,0	The student demonstrates an engagement with solving the identified problems but does not engage spontaneously.
	3,5	
	4,0	
	4,5	
	5,0	

Required reading

1. (Eds), General, Applied and Systems Toxicology, John Wiley and Sons, Online ISBN: 9780470744307, 2009, DOI: 10.1002/9780470744307

Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Faculty of Biotechnology and Animal Husbandry

Field of study	Biotechnology		
Mode of study	stacjonarna	*Level*	drugi
Graduate's qualification	magister inżynier		
Fields of study	dziedzina nauk ścisłych i przyrodniczych, dziedzina nauk rolniczych, dziedzina nauk inżynieryjno-technicznych		
Academic disciplines	nauki biologiczne (5%), technologia żywności i żywienia (10%), rolnictwo i ogrodnictwo (10%), inżynieria chemiczna (5%), inżynieria materiałowa (10%), zootechnika i rybactwo (60%)		
Educational profile	ogólnoakademicki		
Module			
Course unit	**Quality management systems in biotechnology**		
Code	BT_2A_S_20/21_BTA-A-C3		
Field of specialisation	Biotechnology in animal production and environmental protection		
Administering faculty	Katedra Hodowli Trzody Chlewnej, Żywienia Zwierząt i Żywności		
ECTS	1,0	*ECTS (forms)*	1,0
Form of course credit	zaliczenie	*Language*	angielski
Electives		*Elective group*	

Form of instruction	*Cod*	*Semester*	*Hours*	*ECTS*	*Weight*	*Credit*
ćwiczenia audytoryjne	A	1	10	0,5	0,41	zaliczenie
wykłady	W	1	10	0,5	0,59	zaliczenie

Leading teacher	Pietruszka Arkadiusz (Arkadiusz.Pietruszka@zut.edu.pl)
Other teachers	

Prerequisites

W-1	Basic knowledge from economics, marketing, and work organisation. Knowledge about safety and hygiene of work.

Module/course unit objectives

C-1	Introduce students with quality managment systems in food safety production, which are use in research and medical laboratory and enviromental protection.
C-2	Introduce students with rules, methods and tools which are use in organisation (company, firm) for improve the quality.

Course content divided into various forms of instruction		*Number of hours*
T-A-1	Basic concept related to quality managment.	2
T-A-2	The most important rules, methods and quality tools in quality management system.	4
T-A-3	Quality in laboratory research and analyses - research, medicine and calibration laboratory. Audit.	2
T-A-4	EMAS and ISO 14001 standard in practice.	2
T-W-1	Historic view of total quality managment. The doctrine of quality. Sources of motivation.	2
T-W-2	Review of various food safety managment systems (HACCP, ISO 2200, GMP/GHP, IFS/BRC, GLOBAL GAP).	2
T-W-3	Characteristic of ISO 9000 standard (introductionand discussion the most important assumptions), certifications systems.	2
T-W-4	Applications of ISO standards in laboratories.	2
T-W-5	EMAS (Eco Management and Audit Scheme). Standard ISO 14001.	2

Student workload - forms of activity		*Number of hours*
A-A-1	Participation and discussion.	10
A-A-2	Preparing for passing from exercise.	5
A-W-1	Participations in lectures.	10
A-W-2	Preparing for the exam.	5

Teaching methods / tools

M-1	lecture
M-2	lecture and seminars
M-3	didactic duscussion

Evaluation methods (F - progressive, P - final)

Evaluation methods (F - progressive, P - final)		
S-1	F	Evaluation during coursework base on the presentations and discussion.
S-2	P	Test on the end of lectures and exercises.

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6, 7 lub 8 PRK	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6 lub 7 umożliwiających uzyskanie kompetencji inżynierskich	Course objectives	Course content	Teaching methods	Evaluation methods
Knowledge							
BT_2A_BTZ-A-C3_W01 The student is able to explain what is involved quality managemant system in laboratory analysis and environmental protection.	BTap_2A_W03	P7S_WK		C-1 C-2	T-A-1 T-W-4 T-W-2 T-W-5	M-1 M-2 M-3	S-1 S-2
Skills							
BT_2A_BTZ-A-C3_U01 Student is able to use principles, methods and tools in quality managemnt system. Student can verify the compliance of the organisatin's operation with the rules of the quality management.	BTap_2A_U08	P7S_UW	P7S_UW	C-1 C-2	T-A-2 T-A-3	M-1 M-2	S-1 S-2
Social competences							
BT_2A_BTZ-A-C3_K01 Student is aware of the impact of implementation the principles of quality management on the efect of individual and team work. Student is oriented on continuous improvement of processes in the company.	BTap_2A_K05	P7S_KO P7S_KR		C-1 C-2	T-A-2 T-W-3 T-A-4	M-3	S-1

Outcomes	Grade	Evaluation criterion
Knowledge		
BT_2A_BTZ-A-C3_W01	*2,0*	Student nie jest w stanie objaśniać na czy polegają systemy zarządzania jakością, w tym stosowane w produkcji bezpiecznej żywności, w badaniach laboratoryjnych i w ochronie środowiska.
	3,0	Student w niewielkim zakresie jest w stanie objaśniać na czy polegają systemy zarządzania jakością, stosowane w niektórych dzidzinach produkcji i badań
	3,5	Student jest w stanie objaśniać na czy polegają systemy zarządzania jakością, w tym stosowane w produkcji bezpiecznej żywności, w badaniach laboratoryjnych i w ochronie środowiska.
	4,0	Student jest w stanie objaśniać i rozpoznawać na czy polegają systemy zarządzania jakością, w tym stosowane w produkcji bezpiecznej żywności, w badaniach laboratoryjnych i w ochronie środowiska.
	4,5	Student jest w stanie objaśniać, rozpoznawać i dobierać na czy polegają systemy zarządzania jakością, w tym stosowane w produkcji bezpiecznej żywności, w badaniach laboratoryjnych i w ochronie środowiska.
	5,0	Student dokładnie objaśnia, rozpoznawje i trafnie dobiera systemy zarządzania jakością, w tym stosowane w produkcji bezpiecznej żywności, w badaniach laboratoryjnych i w ochronie środowiska.
Skills		
BT_2A_BTZ-A-C3_U01	*2,0*	Student nie potrafii posługiwać się zasadami, metodami i narzędziami stosowanymi w systemach zarządzania jakością.
	3,0	Student w niewielkim zakresie potrafii posługiwać się zasadami, metodami i narzędziami stosowanymi w systemach zarządzania jakością ale nie potrafi zweryfikować zgodności funkcjonowania organizacji (przedsiębiorstwa, firmy) z wymaganiami zasad zarządzania jakością.
	3,5	Student potrafii posługiwać się zasadami, metodami i narzędziami stosowanymi w systemach zarządzania jakością ale w niewielkim zakresie potrafi zweryfikować zgodność funkcjonowania organizacji (przedsiębiorstwa, firmy) z wymaganiami zasad zarządzania jakością.
	4,0	Student potrafii posługiwać się zasadami, metodami i narzędziami stosowanymi w systemach zarządzania jakością. Potrafi zweryfikować zgodność funkcjonowania organizacji (przedsiębiorstwa, firmy) z wymaganiami zasad zarządzania jakością.
	4,5	Student potrafii posługiwać się zasadami, metodami i narzędziami stosowanymi w systemach zarządzania jakością. Trafnie rozwija i potrafi zweryfikować zgodność funkcjonowania organizacji (przedsiębiorstwa, firmy) z wymaganiami zasad zarządzania jakością.
	5,0	Student trafnie potrafii posługiwać się zasadami, metodami i narzędziami stosowanymi w systemach zarządzania jakością. Trafnie szacuje i potrafi zweryfikować zgodność funkcjonowania organizacji (przedsiębiorstwa, firmy) z wymaganiami zasad zarządzania jakością.
Other social competences		
BT_2A_BTZ-A-C3_K01	*2,0*	Student nie ma świadomości wpływu wdrażania zasad zarządzania jakością na efekty pracy indiwidualnej i zespołowej.
	3,0	Student ma w niewielkim zakresie świadomość wpływu wdrażania zasad zarządzania jakością na efekty pracy indiwidualnej i zespołowej. Student w niewielkim zakresie jest zorientowany na ciągłe doskonalenie procesów występujących w organizacji (przedsiebiorstwie, firmie).
	3,5	Student ma świadomość wpływu wdrażania zasad zarządzania jakością na efekty pracy indiwidualnej i zespołowej, chociaż jest słabo zorientowany na ciągłe doskonalenie procesów występujących w organizacji (przedsiebiorstwie, firmie).
	4,0	Student ma świadomość wpływu wdrażania zasad zarządzania jakością na efekty pracy indiwidualnej i zespołowej. Student jest zorientowany na ciągłe doskonalenie procesów występujących w organizacji (przedsiebiorstwie, firmie).
	4,5	Student ma świadomość wpływu wdrażania zasad zarządzania jakością na efekty pracy indiwidualnej i zespołowej. Student jest kratywny i zorientowany na ciągłe doskonalenie procesow występujących w organizacji (przedsiebiorstwie, firmie).
	5,0	Student ma doskonałą świadomość wpływu wdrażania zasad zarządzania jakością na efekty pracy indiwidualnej i zespołowej. Student jest kratywny, otwarty i zorientowany na ciągłe doskonalenie procesow występujących w organizacji (przedsiebiorstwie, firmie).

Required reading

1. Sławomir Wawak, Zarządzanie jakością. Teoria i Praktyka, Wydawnictwo ONE Press, 2005, Wyd. II

2. PA Luning, WJ Marcelis, WMF Jongen., Zarządzanie jakością żywności., Wyd. Naukowo-Techniczne, Warszawa, 2005

Required reading
3. Zofia Zymonik, Koszty jakości w zarządzaniu przedsiębiorstwem, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław, 2002

Supplementary reading
1. ISO, Ogólne wymagania dotyczące kompetencji laboratoriów badawczych i wzorcujących., 2007, 17025
2. ISO, Laboratoria medyczne. Szczególne wymagania dotyczące jakości i kompetencji, 2003, 15189
3. ISO, Systemy zarządzania jakością – Podstawy i terminologia, Wymagania, Wytyczne dla doskonalenia., 2000, 9000, 9001, 9004

Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Faculty of Biotechnology and Animal Husbandry

Field of study	Biotechnology		
Mode of study	stacjonarna	*Level*	drugi
Graduate's qualification	magister inżynier		
Fields of study	dziedzina nauk ścisłych i przyrodniczych, dziedzina nauk rolniczych, dziedzina nauk inżynieryjno-technicznych		
Academic disciplines	nauki biologiczne (5%), technologia żywności i żywienia (10%), rolnictwo i ogrodnictwo (10%), inżynieria chemiczna (5%), inżynieria materiałowa (10%), zootechnika i rybactwo (60%)		
Educational profile	ogólnoakademicki		
Module			
Course unit	**Proteomics**		
Code	BT_2A_S_20/21_BTA-A-C4		
Field of specialisation	Biotechnology in animal production and environmental protection		
Administering faculty	Katedra Fizjologii, Cytobiologii i Proteomiki		
ECTS	3,0	*ECTS (forms)*	3,0
Form of course credit	zaliczenie	*Language*	angielski
Electives		*Elective group*	

Form of instruction	*Cod*	*Semester*	*Hours*	*ECTS*	*Weight*	*Credit*
laboratoria	L	2	20	1,5	0,41	zaliczenie
wykłady	W	2	10	1,5	0,59	zaliczenie

Leading teacher	Ożgo Małgorzata (Malgorzata.Ozgo@zut.edu.pl)
Other teachers	Dratwa-Chałupnik Alicja (Alicja.Dratwa-Chalupnik@zut.edu.pl), Herosimczyk Agnieszka (Agnieszka.Herosimczyk@zut.edu.pl), Lepczyński Adam (Adam.Lepczynski@zut.edu.pl), Michałek Katarzyna (Katarzyna.Michalek@zut.edu.pl)

Prerequisites	
W-1	Basic of the cell biology and the protein biochemistry.
W-2	Basic knowledge of genetics.

Module/course unit objectives	
C-1	Theoretical and practical knowledge of gel-based and chromatographic protein separation techniques.
C-2	The ability of the participants to use advanced bioinformatic tools to analyse proteomic data (1-D and 2-D gels, mass spectra).
C-3	Practical use of MALDI-TOF MS (matrix-assisted laser desorption/ionisation time of flight mass spectrometer) for protein identification.

Course content divided into various forms of instruction		*Number of hours*
T-L-1	Sample preparation techniques for proteomic analysis.	3
T-L-2	Protein separation using two-dimensional electrophoresis (2-DE).	3
T-L-3	Protein separation using SDS-PAGE (1-DE).	3
T-L-4	Protein gel staining methods.	2
T-L-5	Identification of proteins using mass spectrometer MALTI-TOF.	3
T-L-6	Identification of proteins using Western-blot technique.	3
T-L-7	1-DE and 2-DE gel image acquisition and bioinformatic analysis.	3
T-W-1	Introduction to proteomics. Biological significance of post-transcriptional and post-translational protein modifications. Proteome organization. The general principles of proteomic analysis.	2
T-W-2	Gel-based protein separation techniques. The components of resolving gel matrix. Sodium-dodecyl polyacrylamide gel electrophoresis (SDS-PAGE), the principle and application of native PAGE electrophoresis. Two dimensional electrophoresis (2-DE) – the principle of the method, sample preparation for 2-DE, IPG strips, isoelectric focusing.	2
T-W-3	Protein detection methods: coomassie stain, silver stain, negative ion staining (copper, zinc), autoradiography, fluorography, fluorescent staining. Two-dimensional difference in gel electrophoresis (2D-DIGE) – the principle and application of the method. Image acquisition and analysis of 1-D and 2-D gels. 1-D and 2-D gels analysis softwares.	2
T-W-4	Application of mass spectrometry (MS) for protein identification. Ionization methods in mass spectrometry. Types of mass analyzers. Peptide mass fingerprinting (PMF).	2
T-W-5	Identification of proteins using Western-blot technique. Sample preparation. Methods of protein transfer. Incubation with antibodies. Visualisation.	2

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Faculty of Biotechnology and Animal Husbandry

Student workload - forms of activity		*Number of hours*
A-L-1	Participation in laboratories.	20
A-L-2	Self work with publications.	12
A-L-3	Laboratory project preparation.	13
A-W-1	Participation in lectures.	10
A-W-2	Study of the recommended scientific literature.	15
A-W-3	Preparing for the writing test.	20

Teaching methods / tools	
M-1	Theoretical lectures.
M-2	Discussion during laboratory classes.
M-3	Project preparation.

Evaluation methods (F - progressive, P - final)		
S-1	F	Project presentation in the writing form.
S-2	P	Writing test.

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6, 7 lub 8 PRK	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6 lub 7 umożliwiających uzyskanie kompetencji inżynierskich	Course objectives	Course content	Teaching methods	Evaluation methods
Knowledge							
BT_2A_BTZ-A-C4_W01 Student can enumerate and describe commonly used techniques used in the study of proteins.	BTap_2A_W01 BTap_2A_W06 BTap_2A_W08 BTap_2A_W16	P7S_WG	P7S_WG	C-1 C-2	T-W-1 T-W-4 T-W-2 T-W-5 T-W-3	M-1 M-2	S-2
Skills							
BT_2A_BTZ-A-C4_U01 Student is able to use commonly known proteomic techniques such as: 1-DE, 2-DE, MALDI-TOF MS and Western-blot.	BTap_2A_U02 BTap_2A_U05 BTap_2A_U07	P7S_UK P7S_UO P7S_UU P7S_UW	P7S_UW	C-3	T-L-1 T-L-5 T-L-2 T-L-6 T-L-3 T-L-7 T-L-4	M-3	S-1
Social competences							
BT_2A_BTZ-A-C4_K01 Student is aware that there is a number of methods to analyse the different levels of protein changes in response to various physiological/patophysiological stimmuli in the biological material.	BTap_2A_K01 BTap_2A_K02 BTap_2A_K05	P7S_KK P7S_KO P7S_KR		C-1 C-2 C-3	T-L-1 T-L-7 T-L-2 T-W-1 T-L-3 T-W-2 T-L-4 T-W-3 T-L-5 T-W-4 T-L-6 T-W-5	M-1 M-2 M-3	S-1 S-2

Outcomes	Grade	Evaluation criterion
Knowledge		
BT_2A_BTZ-A-C4_W01	*2,0*	
	3,0	- student has a basic knowledge in the frame of the material program - student exerts low attitude to knowledge - in the frame of expressing knowledge student makes a lot of mistakes
	3,5	
	4,0	
	4,5	
	5,0	
Skills		
BT_2A_BTZ-A-C4_U01	*2,0*	
	3,0	Student, with a help of a teacher is able to meet the challenges of preparing an appropriate laboratory protocol.
	3,5	
	4,0	
	4,5	
	5,0	
Other social competences		
BT_2A_BTZ-A-C4_K01	*2,0*	
	3,0	Student shows a moderate interest in participating in a verbal discussion with the teacher and colleagues during the classes.
	3,5	
	4,0	
	4,5	
	5,0	

Required reading

Required reading
1. Sheehan D., Tyther R. (Ed.)., Two-dimensional electrophoresis protocols., Humana Press, New York, 2009
2. Garfin D., Ahuja S. (Ed.), Handbook of isoelectric focusing and proteomics., Elsevier Academic Press, Amsterdam, 2005
3. Heftmann E. (Ed.)., Chromatography, sixth edition., Elsevier Academic Press, Amsterdam, 2004
4. Walker J.M. (Ed.), second edition., The proteomics protocols handbook., Humana Press, New Jersey, 2002
5. Rabilloud T. (Ed.), Proteome research: two-dimensional gel electrophoresis and identification methods., Springer, Berlin, 2000
6. Hames B.D. (Ed.), third edition., Gel electrophoresis of proteins: a practical approach., Oxford University Press, England, 1998

Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Faculty of Biotechnology and Animal Husbandry

Field of study	Biotechnology		
Mode of study	stacjonarna	*Level*	drugi
Graduate's qualification	magister inżynier		
Fields of study	dziedzina nauk ścisłych i przyrodniczych, dziedzina nauk rolniczych, dziedzina nauk inżynieryjno-technicznych		
Academic disciplines	nauki biologiczne (5%), technologia żywności i żywienia (10%), rolnictwo i ogrodnictwo (10%), inżynieria chemiczna (5%), inżynieria materiałowa (10%), zootechnika i rybactwo (60%)		
Educational profile	ogólnoakademicki		
Module			
Course unit	**Genomics and transcriptomics**		
Code	BT_2A_S_20/21_BTA-A-C5		
Field of specialisation	Biotechnology in animal production and environmental protection		
Administering faculty	Katedra Genetyki i Ogólnej Hodowli Zwierząt		
ECTS	4,0	*ECTS (forms)*	4,0
Form of course credit	zaliczenie	*Language*	angielski
Electives		*Elective group*	

Form of instruction	*Cod*	*Semester*	*Hours*	*ECTS*	*Weight*	*Credit*
ćwiczenia audytoryjne	A	2	15	1,5	0,29	zaliczenie
laboratoria	L	2	15	1,0	0,29	zaliczenie
wykłady	W	2	15	1,5	0,42	zaliczenie

Leading teacher	Polasik Daniel (Daniel.Polasik@zut.edu.pl)
Other teachers	Jędrzejczak-Silicka Magdalena (mjedrzejczak@zut.edu.pl), Polasik Daniel (Daniel.Polasik@zut.edu.pl), Szatkowska Iwona (Iwona.Szatkowska@zut.edu.pl)

Prerequisites

W-1	Knowledge in the area of molecular genetics and genetic engineering

Module/course unit objectives

C-1	Presentation of issues associated with genome analysis
C-2	Introduction to genomes projects and methods of their accomplishment
C-3	Familiarizing with the databases as a way of genomes analysis results

Course content divided into various forms of instruction		*Number of hours*
T-A-1	Genomic diseases	2
T-A-2	Transcripts analysis by use of RNA-seq method	4
T-A-3	Retrotransposon-based markers	2
T-A-4	Current projects of genomes analysis	1
T-A-5	Structural genomics - sequencig of DNA fragments and whole genomes	2
T-A-6	Transcripts analysis by use of microarrays	4
T-L-1	Design of restriction map. Restriction analysis.	4
T-L-2	Mitochondrial DNA isolation and analysis (D-LOOP)	6
T-L-3	Isolation of total RNA, methods for purification, analysis of isolates	2
T-L-4	Methods for RNA transcripts analysis	3
T-W-1	Introduction - discipline development, research areas, main genomic projects	2
T-W-2	Structural genomics - genetic and physical mapping	2
T-W-3	Functional genomics - discovery of functional DNA elements in genomes	1
T-W-4	Origin of new genes in genome	2
T-W-5	RNA classess - features, functions	2
T-W-6	Comparative analysis of transcripts derived from different animal tissues	2
T-W-7	Transcription factors and their role in tissue-specific expression	2
T-W-8	Post-transcriptional modification	2

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Student workload - forms of activity		*Number of hours*
A-A-1	Attend the classes	15
A-A-2	Consultation with the teacher	6
A-A-3	Individual preparing for examination	20
A-A-4	Written examination	4
A-L-1	Attend the laboratory classes	15
A-L-2	Study of given literature	6
A-L-3	Consultation with the teacher	2
A-L-4	Individual preparing for examination	6
A-L-5	Written examination	1
A-W-1	Attend the lectures	15
A-W-2	Individual preparing for examination	15
A-W-3	Consultation with the teacher	6
A-W-4	Written examination	4
A-W-5	Literature study	5

Teaching methods / tools	
M-1	Lecture
M-2	Multimedia presentation by use PC and projector
M-3	Work in laboratory groups

Evaluation methods (F - progressive, P - final)		
S-1	F	Assessment of student activity and preparation for classes
S-2	P	Grade covering the lecture content

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6, 7 lub 8 PRK	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6 lub 7 umożliwiających uzyskanie kompetencji inżynierskich	Course objectives	Course content	Teaching methods	Evaluation methods
Knowledge							
BT_2A_BTZ-A-C5_W01 In the field of knowledge student explains issues of genomic sequences analysis; can define methods for human and animal genomes projects accomplishment	BTap_2A_W07	P7S_WG		C-1 C-2 C-3	T-A-1 T-W-1 T-A-2 T-W-2 T-A-3 T-W-3 T-A-4 T-W-4 T-L-1 T-W-5 T-L-2 T-W-6 T-L-3 T-W-7 T-L-4	M-1 M-2 M-3	S-1 S-2
BT_2A_BTZ-A-C5_W02 Student has knowledge of transcriptomics in terms of analysis of gene expression and investigation of their structure and function. He has familiarized with the mechanisms of genomes evolution, its rearrangement and response to stress	BTap_2A_W07	P7S_WG		C-1 C-2 C-3	T-A-1 T-W-1 T-A-2 T-W-2 T-A-3 T-W-3 T-A-4 T-W-4 T-L-1 T-W-5 T-L-2 T-W-6 T-L-3 T-W-7 T-L-4	M-1 M-2 M-3	S-1 S-2
Skills							
BT_2A_BTZ-A-C5_U01 Student gained skills for holistic view into the genome, taking into consideartion its structure and function as well as aspects of evolution	BTap_2A_U06	P7S_UW		C-1 C-2	T-A-5 T-W-3 T-W-1 T-W-4 T-W-2	M-1 M-2 M-3	S-1
BT_2A_BTZ-A-C5_U02 Student has acquired ability to plan appropriate research strategies to understand the structure of the genome, its functions and evolution. He has become acquainted with mechanisms and factors reducing the stability of the genome. In addition, he acquired the ability to search databases containing deposited data on sequences and genomes	BTap_2A_U06	P7S_UW		C-1 C-2 C-3	T-A-1 T-L-3 T-A-2 T-L-4 T-A-3 T-W-5 T-A-4 T-W-6 T-L-1 T-W-7 T-L-2	M-2 M-3	S-1
Social competences							
BT_2A_BTZ-A-C5_K01 Student can create an active attitude, has the ability to analyze comprehensive look at the facts and see issues in a broad context.	BTap_2A_K05	P7S_KO P7S_KR		C-1 C-2 C-3	T-A-1 T-W-3 T-W-1 T-W-4 T-W-2	M-3	S-1

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Faculty of Biotechnology and Animal Husbandry

Outcomes	Grade	Evaluation criterion
Knowledge		
BT_2A_BTZ-A-C5_W01	*2,0*	Student does not have sufficient knowledge of the genomic sequences
	3,0	Student explains the issues related to the analysis of genomic sequences. He can define methods for analysis the genomes of humans and animals.
	3,5	Student has sufficient knowledge about genomes projects of different species
	4,0	Student is able to define and explain issues related to the genomes projects
	4,5	Student has a wide and well-ordered knowledge concerning genomes of different species
	5,0	Student next to well-established knowledge can argue the selection of specific methods used in genomic projects
BT_2A_BTZ-A-C5_W02	*2,0*	Student nie posiada wystarczającej wiedzy z zakresu analizy ekspresji genów
	3,0	Posiada wiedzę z zakresu z transkryptomiki pod kątem analizy ekspresji genów i badaniem ich struktury oraz funkcji. Zapoznał z mechanizmami warunkującymi ewolucję genomu, jego rearanżację i odpowiedź na stresy.
	3,5	Student posiada wystarczajacą wiedzę na temat mechanizmów warunkujących rearanżację genomu
	4,0	Student samodzielnie potrafi analizować poszczególne funkcje genomu
	4,5	Student ma szeroką i usystematyzowana wiedzą z zakresu z zakresu transkryptomiki pod kątem badan genomowych
	5,0	Student posiada bogatą wiedzę oraz potrafi wyciągać wnioski z przedstawianej analizy oraz rearanżacji genomu
Skills		
BT_2A_BTZ-A-C5_U01	*2,0*	
	3,0	Student gained skills for holistic view into the genome, taking into consideartion its structure and function as well as aspects of evolution
	3,5	
	4,0	
	4,5	
	5,0	
BT_2A_BTZ-A-C5_U02	*2,0*	
	3,0	Nabył umiejętności zaplanowania odpowiednich strategii badawczych dla poznania struktury genomu, jego funkcji i ewolucji. Poznał mechanizmy oraz czynniki zmniejszających stabilność genomu. Ponadto nabył miejętność zapoznania się z bazami danych zawierającymi zdeponowane dane o sekwencjach i genomach.
	3,5	
	4,0	
	4,5	
	5,0	
Other social competences		
BT_2A_BTZ-A-C5_K01	*2,0*	
	3,0	Student can create an active attitude, has the ability to analyze comprehensive look at the facts and see issues in a broad context.
	3,5	
	4,0	
	4,5	
	5,0	

Required reading

1. Brown T.A., Genomes 3rd edition, Garland Science, 2006

2. Starkey M., Elaswarapu R., Genomics: Essential Methods, John Wiley & Sons, Ltd, 2010

Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Faculty of Biotechnology and Animal Husbandry

Field of study	Biotechnology		
Mode of study	stacjonarna	*Level*	drugi
Graduate's qualification	magister inżynier		
Fields of study	dziedzina nauk ścisłych i przyrodniczych, dziedzina nauk rolniczych, dziedzina nauk inżynieryjno-technicznych		
Academic disciplines	nauki biologiczne (5%), technologia żywności i żywienia (10%), rolnictwo i ogrodnictwo (10%), inżynieria chemiczna (5%), inżynieria materiałowa (10%), zootechnika i rybactwo (60%)		
Educational profile	ogólnoakademicki		
Module			
Course unit	**Cellular engineering in animal reproduction**		
Code	BT_2A_S_20/21_BTA-A-D3		
Field of specialisation	Biotechnology in animal production and environmental protection		
Administering faculty	Katedra Biotechnologii Rozrodu Zwierząt i Higieny Środowiska		
ECTS	3,0	*ECTS (forms)*	3,0
Form of course credit	egzamin	*Language*	angielski
Electives		*Elective group*	

Form of instruction	*Cod*	*Semester*	*Hours*	*ECTS*	*Weight*	*Credit*
ćwiczenia audytoryjne	A	2	10	1,0	0,29	zaliczenie
laboratoria	L	2	10	1,0	0,29	zaliczenie
wykłady	W	2	10	1,0	0,42	egzamin

Leading teacher	Stankiewicz Tomasz (Tomasz.Stankiewicz@zut.edu.pl)
Other teachers	Błaszczyk Barbara (Barbara.Blaszczyk@zut.edu.pl), Gączarzewicz Dariusz (dariusz.gaczarzewicz@zut.edu.pl), Lasota Bogdan (Bogdan.Lasota@zut.edu.pl), Seremak Beata (Beata.Seremak@zut.edu.pl), Stankiewicz Tomasz (Tomasz.Stankiewicz@zut.edu.pl), Udała Jan (Jan.Udala@zut.edu.pl)

Prerequisites	
W-1	Knowledge of the basics of biotechnology and biotechnology in animal reproduction.

Module/course unit objectives	
C-1	Acquainting students with the methods of cellular engineering used in manipulations on gametes and embryos of mammals.
C-2	Acquainting students with the procedure for the transfer of embryos in different species of animals.
C-3	Acquainting students with the possibilities of using cell culture in the studies of mammalian reproductive processes.
C-4	Formation of proper attitude of the students in relation to the use of cell engineering in mammalian reproduction.

Course content divided into various forms of instruction		*Number of hours*
T-A-1	The growth and development of the oocytes in physiological conditions.	2
T-A-2	Factors influencing for the quantity and quality of the embryos. The activation of mammalian oocytes in vitro.	2
T-A-3	The importance of cell cultures in vitro during the studies of reproductive processes.	2
T-A-4	The activation of mammalian oocytes in vitro - methods and the importance. The enucleation of the oocytes.	2
T-A-5	The use of germ cells for the production of transgenic animals. The cloning embryos - the importance and methods, potential and regulatory capabilities of blastomeres.	2
T-L-1	Morphological evaluation of the oocytes by using histological preparations.	2
T-L-2	Obtaining of the oocytes from the ovaries of selected mammals, evaluation of the quality and usefulness of the oocytes for in vitro studies.	2
T-L-3	The preparation of the oocytes for in vitro maturation. The assessment of the degree of maturity of the oocytes in IVM procedure.	2
T-L-4	The evaluation of the sperm. Methods of sperm capacitation and their preparation for in vitro fertilization .	2
T-L-5	In vitro fertilization and culture of embryos to the blastocyst stage. The evaluation of the quality of embryos. The analysis of the physiological state of the female reproductive system as a potential recipient of embryos.	2
T-W-1	The history, development and current state in the use of cellular engineering of mammalian reproduction.	2

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Course content divided into various forms of instruction		*Number of hours*
T-W-2	The reproductive potential of the female. Methods of collection and storage the female gametes.	2
T-W-3	The reproductive potential of the male. Methods of obtaining male gametes. Possibility of using sperm in the transgenesis as a carrier foreign of genetic information.	1
T-W-4	In vivo fertilization and in vitro fertilization. Methods for the possibility of using in vitro fertilization in various mammalian species (insemination of oocytes, intracytoplasmic injection).	2
T-W-5	The possibility of long-term preservation of embryos and the processes that occur during freezing and thawing. The properties and the possibility of germ cell transplantation.	2
T-W-6	The control of gender in livestock - of applications of practical importance.	1

Student workload - forms of activity		*Number of hours*
A-A-1	Participation in the classes.	10
A-A-2	Participation in the consultations.	2
A-A-3	Preparing to pass the exercise.	18
A-L-1	Participation in the classes.	10
A-L-2	Preparing for laboratory classes.	5
A-L-3	Preparing to pass the exercise.	10
A-L-4	Participation in the consultations.	5
A-W-1	Participation in the classes.	15
A-W-2	Participation in the consultations.	2
A-W-3	Preparing to pass the exercise.	13

Teaching methods / tools	
M-1	The informative lecture using multimedia techniques.
M-2	The demonstration, laboratory exercises (slides, macro- and microscopic observation).

Evaluation methods (F - progressive, P - final)		
S-1	F	Current control on the proper operation of laboratory classes by students.
S-2	P	Final test covering a range of content lectures.
S-3	P	Final test covering a range of exercise program content.

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6, 7 lub 8 PRK	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6 lub 7 umożliwiających uzyskanie kompetencji inżynierskich	Course objectives	Course content	Teaching methods	Evaluation methods
Knowledge							
BTap_2A_BTA-A-D3_W01 Student knows the most important facts and achievements in the field of cellular engineering in mammalian reproduction. He knows the factors that determine the reproductive potential of mammals. Student specifies and describes methods of cellular engineering used in manipulations on gametes and embryos.	BTap_2A_W01 BTap_2A_W08	P7S_WG	P7S_WG	C-1 C-4	T-L-1 T-W-1 T-L-2 T-W-2 T-L-3 T-W-3 T-L-4 T-W-4 T-L-5	M-1 M-2	S-1 S-2 S-3
BTap_2A_BTA-A-D3_W02 Student knows methods of embryos collection and transfer. He describes potential benefits of embryo transfer in animal husbandry.	BTap_2A_W08 BTap_2A_W09	P7S_WG	P7S_WG	C-2 C-4	T-A-2 T-W-4 T-A-5 T-W-5 T-W-2 T-W-6	M-1	S-2 S-3
Skills							
BTap_2A_BTA-A-D3_U01 Students know how to acquire and assess the quality of gametes. He can carried out sperm capacitation and set up the cultures in procedures IVM, IVF and IVC.	BTap_2A_U05 BTap_2A_U06	P7S_UK P7S_UO P7S_UU P7S_UW	P7S_UW	C-1 C-3	T-L-1 T-L-4 T-L-2 T-L-5 T-L-3	M-2	S-1
BTap_2A_BTA-A-D3_U02 Student knows how to evaluate the quality of embryos. He can correctly schedule of embryo transfer procedure.	BTap_2A_U05 BTap_2A_U08	P7S_UK P7S_UO P7S_UU P7S_UW	P7S_UW	C-2	T-A-5 T-L-5	M-1 M-2	S-2 S-3
Social competences							
BTap_2A_BTA-A-D3_K01 Student is aware of the importance of the knowledge. He knows the advantages and limitations associated with the use of cellular engineering in mammalian reproduction. The completion of the course will be helpful in his future professional work.	BTap_2A_K01	P7S_KK P7S_KO P7S_KR		C-4	T-L-1 T-W-1 T-L-2 T-W-2 T-L-3 T-W-3 T-L-4 T-W-4 T-L-5	M-1	S-1

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Outcomes	Grade	Evaluation criterion
Knowledge		
BTap_2A_BTA-A-D3_W01	*2,0*	
	3,0	The student knows some facts and achievements in the field of cellular engineering application in mammalian reproduction. He lists the factors determining the reproductive potential of females and males and lists some of the methods used in the manipulation of gametes and embryos.
	3,5	
	4,0	
	4,5	
	5,0	
BTap_2A_BTA-A-D3_W02	*2,0*	
	3,0	Student lists of embryo collection methods and determines the benefits of embryo transfer.
	3,5	
	4,0	
	4,5	
	5,0	
Skills		
BTap_2A_BTA-A-D3_U01	*2,0*	
	3,0	Student is able to obtain of oocytes using a single method. He is able to assess the quality of semen, carry out the sperm capacitation at least one species of animals. He is able to assess the degree of oocytes maturity and assumes cultures for IVM, IVF and IVC.
	3,5	
	4,0	
	4,5	
	5,0	
BTap_2A_BTA-A-D3_U02	*2,0*	
	3,0	Student is able to assess quality of the embryos at least in some stages of development. Student describes a general scheme embryo transfer procedures but does not include physiological conditions of the female, and species differences.
	3,5	
	4,0	
	4,5	
	5,0	
Other social competences		
BTap_2A_BTA-A-D3_K01	*2,0*	
	3,0	Student knows only the positives or only the limitations associated with the use of cellular engineering in mammalian reproduction. Do not take the discussion in this regard.
	3,5	
	4,0	
	4,5	
	5,0	

Required reading

1. Hafez E.S.E., Hafez B., Reproduction in farm animals, Lippincott Williams & Wilkins, Philadelphia (U.A), 2000

Supplementary reading

1. Gordon I. R., Reproductive technologies in farm animals, CABI Pub, Wallingford, Oxfordshire, Cambridge, MA, 2004

Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Faculty of Biotechnology and Animal Husbandry

Field of study	Biotechnology		
Mode of study	stacjonarna	*Level*	drugi
Graduate's qualification	magister inżynier		
Fields of study	dziedzina nauk ścisłych i przyrodniczych, dziedzina nauk rolniczych, dziedzina nauk inżynieryjno-technicznych		
Academic disciplines	nauki biologiczne (5%), technologia żywności i żywienia (10%), rolnictwo i ogrodnictwo (10%), inżynieria chemiczna (5%), inżynieria materiałowa (10%), zootechnika i rybactwo (60%)		
Educational profile	ogólnoakademicki		
Module			
Course unit	**Animal embryology**		
Code	BT_2A_S_20/21_BTA-A-D4		
Field of specialisation	Biotechnology in animal production and environmental protection		
Administering faculty	Katedra Biotechnologii Rozrodu Zwierząt i Higieny Środowiska		
ECTS	3,0	*ECTS (forms)*	3,0
Form of course credit	egzamin	*Language*	angielski
Electives		*Elective group*	

Form of instruction	*Cod*	*Semester*	*Hours*	*ECTS*	*Weight*	*Credit*
ćwiczenia audytoryjne	A	1	5	1,0	0,29	zaliczenie
laboratoria	L	1	10	1,0	0,29	zaliczenie
wykłady	W	1	15	1,0	0,42	egzamin

Leading teacher	Stankiewicz Tomasz (Tomasz.Stankiewicz@zut.edu.pl)
Other teachers	Błaszczyk Barbara (Barbara.Blaszczyk@zut.edu.pl), Stankiewicz Tomasz (Tomasz.Stankiewicz@zut.edu.pl), Udała Jan (Jan.Udala@zut.edu.pl)

Prerequisites	
W-1	The knowledge of animal physiology and biotechnology in animal reproduction.

Module/course unit objectives	
C-1	To acquaint students with the course of the various stages of embryonic and fetal development.
C-2	To acquaint students with the mechanisms that control the development of embryonic and fetal development with particular emphasis on the role of amniotic fluid and placenta.

Course content divided into various forms of instruction		*Number of hours*
T-A-1	The degree of development of the embryo in different stages of the cleavage and gastrulation (epiblast phase, hypoblast phase, the differentiation of axial organs).	1
T-A-2	The blood circulation in the placenta, transport the removable substances through the placenta.	2
T-A-3	The development of the urogenital system. The differentiation of origin endodermal organs. The development of respiratory and digestive systems.	2
T-L-1	The types of the placentas in various species of mammals and anatomical differences in their construction.	2
T-L-2	The structure and function of the fetal membranes.	2
T-L-3	The pregnancy (calculation date of birth). The parturition. The development of the fetus and fetal maturity.	2
T-L-4	The development of the hematopoietic system: the development of erythroid and white blood cells.	2
T-L-5	Evaluation age of the embryo and fetus based on the size and shape of the body.	2
T-W-1	Embryology as a scientific discipline and a range of modern embryology of animals.	2
T-W-2	The course and the types of implantation.	2
T-W-3	The role of fetal-placental endocrine system in the fetal development. Hormonal regulation of pregnancy and parturition.	2
T-W-4	The development and metabolism of the embryo in the initial period of postimplantation. The mechanism of the formation of the twin pregnancy.	2
T-W-5	Adapting to embryonic and fetal life and the role of the transitional organs.	2
T-W-6	The mechanisms of organogenesis and chronological division of the differentiation of the final organs.	2
T-W-7	The differentiation of mesodermal organs (somites, median mesoderm).	2
T-W-8	The embryonic induction. The possibilities of the using cord blood in the transplantation.	1

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Student workload - forms of activity		*Number of hours*
A-A-1	The participation in the classes.	5
A-A-2	Preparing the presentation.	16
A-A-3	Preparing to pass the exercise.	9
A-L-1	The participation in the classes.	10
A-L-2	Participation in the consultations.	3
A-L-3	Preparing to pass the exercise.	17
A-W-1	Participation in the classes.	15
A-W-2	Participation in the consultations.	2
A-W-3	The study of the professional literature. Preparing to pass lectures.	13

Teaching methods / tools	
M-1	The informative lecture with the use of multimedia techniques.
M-2	Activating methods (preparation and presentation of papers by students, discussion).
M-3	The demonstration, laboratory exercises (the macro- and microscopic observation).

Evaluation methods (F - progressive, P - final)		
S-1	F	The rating presentations prepared and delivered by students (teamwork) and engage in the discussion.
S-2	F	The current control of the proper operation of students in laboratory classes.
S-3	P	The rfinal test covering a range of content of lectures and exercises.

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6, 7 lub 8 PRK	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6 lub 7 umożliwiających uzyskanie kompetencji inżynierskich	Course objectives	Course content	Teaching methods	Evaluation methods
Knowledge							
BT_2A_BTZ-A-D4_W01 Student defines the basic terminology in the field of embryology. He describes the various stages and mechanisms of embryonic and fetal development.	BTap_2A_W06	P7S_WG		C-1	T-A-1 T-W-1 T-A-3 T-W-4 T-L-3 T-W-6 T-L-4 T-W-7 T-L-5 T-W-8	M-1 M-2 M-3	S-1 S-2 S-3
Skills							
BT_2A_BTZ-A-D4_U01 Student is able to determine the degree of development of the embryo and fetus on the basis of the morphological characteristics. He is able to assess the species adherence of placentas and fetal membranes. He points to the distinctiveness in the morphological images of the fetal blood.	BTap_2A_U06 BTap_2A_U07	P7S_UW		C-1	T-L-1 T-L-4 T-L-2 T-L-5 T-L-3	M-1 M-3	S-2 S-3
Social competences							
BT_2A_BTZ-A-D4_K01 After completing the course, the student will have a basis for studying disciplines related to the obtaining of extracorporeal embryos in vitro, the cloning, transgenesis and transplantation.	BTap_2A_K08	P7S_KO		C-1 C-2	T-A-1 T-L-4 T-A-2 T-L-5 T-A-3 T-W-5 T-L-1 T-W-6 T-L-2 T-W-7 T-L-3 T-W-8	M-1 M-3	S-3

Outcomes	Grade	Evaluation criterion
Knowledge		
BT_2A_BTZ-A-D4_W01	*2,0*	
	3,0	The student knows the basic terminology in the field of animal embryology. He mentions the successive stages of embryonic development and mechanisms, some of which he describes.
	3,5	
	4,0	
	4,5	
	5,0	
Skills		
BT_2A_BTZ-A-D4_U01	*2,0*	
	3,0	On the basis of criteria a student assesses the degree of development of the embryo and fetus. He recognizes some types of placentas. He points to the distinctiveness in the morphological picture of blood in some species.
	3,5	
	4,0	
	4,5	
	5,0	

Other social competences		
BT_2A_BTZ-A-D4_K01	*2,0*	
	3,0	The student is aware of existing knowledge in further study of scientific disciplines related to gamete manipulation.
	3,5	
	4,0	
	4,5	
	5,0	

Required reading

1. T. A. McGeady, P. J. Quinn, E. S. FitzPatrick, M. T. Ryan, Veterinary Embryology, Blackwell Publishing, 2006

Supplementary reading

1. Poul Hyttel, Fred Sinowatz, Morten Vejlsted, Morten Vejlsted, Essentials of Domestic Animal Embryology, Saunders Ltd., 2010

Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Faculty of Biotechnology and Animal Husbandry

Field of study	Biotechnology		
Mode of study	stacjonarna	*Level*	drugi
Graduate's qualification	magister inżynier		
Fields of study	dziedzina nauk ścisłych i przyrodniczych, dziedzina nauk rolniczych, dziedzina nauk inżynieryjno-technicznych		
Academic disciplines	nauki biologiczne (5%), technologia żywności i żywienia (10%), rolnictwo i ogrodnictwo (10%), inżynieria chemiczna (5%), inżynieria materiałowa (10%), zootechnika i rybactwo (60%)		
Educational profile	ogólnoakademicki		
Module			
Course unit	**Animal nutrition in relation to efficiency production and environment protection**		
Code	BT_2A_S_20/21_BTA-A-D5		
Field of specialisation	Biotechnology in animal production and environmental protection		
Administering faculty	Katedra Hodowli Trzody Chlewnej, Żywienia Zwierząt i Żywności		
ECTS	2,0	*ECTS (forms)*	2,0
Form of course credit	zaliczenie	*Language*	polski
Electives		*Elective group*	

Form of instruction	*Cod*	*Semester*	*Hours*	*ECTS*	*Weight*	*Credit*
laboratoria	L	3	15	1,0	0,41	zaliczenie
wykłady	W	3	15	1,0	0,59	zaliczenie

Leading teacher	Pietruszka Arkadiusz (Arkadiusz.Pietruszka@zut.edu.pl)
Other teachers	Kołodziej-Skalska Anita (Anita.Kolodziej@zut.edu.pl)

Prerequisites

W-1	Basic knowledge about chemistry, nutrition, nutrients, and animal digestive physiology.

Module/course unit objectives

C-1	Knowledge about the nutritional value of food products, the structure and importance of nutrients and the impact of nutrition and diet on animal production and environment protection.

Course content divided into various forms of instruction		*Number of hours*
T-L-1	Methods of determination of the basic nutrients in feed– introduction	2
T-L-2	Determination of dry matter, ash and crude protein	2
T-L-3	Determination of crude fiber, fiber fractions (NDF, ADL, ADF) and crude fat	3
T-L-4	Assessment of the nutritional protein value	3
T-L-5	Estimate chemical assessment of the nutritional protein value	3
T-L-6	Interpretation of the obtained results and conclusions	2
T-W-1	Animal nutrition – basic terms.	3
T-W-2	Nutritional value of protein.	2
T-W-3	Lipids - role of fatty acids in animal production and human health.	3
T-W-4	Role of carbohydrates in animal production and human health.	3
T-W-5	The influence of animal nutrition on environment.	3
T-W-6	Summary and conclusions.	1

Student workload - forms of activity		*Number of hours*
A-L-1	Participation in classes	15
A-L-2	Reading specific literature	10
A-L-3	Preparing projects in groups	5
A-W-1	Participation in lectures	15
A-W-2	Reading specific literature	10
A-W-3	Preparing for the exam	5

Teaching methods / tools

M-1	Multimedia lecture

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Faculty of Biotechnology and Animal Husbandry

Teaching methods / tools	
M-2	Didactic disscusion
M-3	Educational movies
M-4	Practical exercises in laboratory

Evaluation methods (F - progressive, P - final)		
S-1	F	Short test
S-2	F	Practical exam
S-3	P	Writing exam

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6, 7 lub 8 PRK	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6 lub 7 umożliwiających uzyskanie kompetencji inżynierskich	Course objectives	Course content	Teaching methods	Evaluation methods
Knowledge							
BT_2A_BTZ-A-D5_W01 Student has broadened general knowledge about the impact of animal nutrition on production, environment protection and human health.	BTap_2A_W13	P7S_WG		C-1	T-L-1 T-W-4 T-L-4 T-W-5 T-W-1 T-W-6 T-W-3	M-1 M-2 M-3	S-1 S-3
Skills							
BT_2A_BTZ-A-D5_U01 Student follows the rules of Good Laboratory Practice, conducts determinations and interprets the results of basic composition of food products and chooses healthy ones. Student estimates and analyzes the risks associated with the use of GMO in food.	BTap_2A_U04 BTap_2A_U10	P7S_UW		C-1	T-L-2 T-L-5 T-L-3 T-L-6 T-L-4 T-W-6	M-1 M-3 M-4	S-2 S-3
Social competences							
BT_2A_BTZ-A-D5_K01 Student demonstrates the need to constantly improve general and directional knowledge, discipline in individual work willing to participate in group work, can creatively plan and implement own and team activities.	BTap_2A_K01 BTap_2A_K05	P7S_KK P7S_KO P7S_KR		C-1	T-L-1 T-W-1 T-L-2 T-W-3 T-L-3 T-W-4 T-L-4 T-W-5 T-L-5 T-W-6 T-L-6	M-1 M-2 M-3 M-4	S-2 S-3

Outcomes	Grade	Evaluation criterion
Knowledge		
BT_2A_BTZ-A-D5_W01	*2,0*	Student does not have sufficient knowledge about the impact of food and diet on human health.
	3,0	Student has sufficient knowledge about the impact of food and diet on human health.
	3,5	Student has basic knowledge about the impact of food and diet on human health, knows and interpets
	4,0	Student has general knowledge about the impact of food and diet on human health.
	4,5	Student has broadened knowledge about the impact of food and diet on human health.
	5,0	Student has broadened, specific knowledge about the impact of food and diet on human health.
Skills		
BT_2A_BTZ-A-D5_U01	*2,0*	Student does not have sufficient abilities in aspects of impact of food and diet on human health, can not conduct basic laboratory analyses and interpret the results od basic composition of food.
	3,0	Student has sufficient abilities in aspects of impact of food and diet on human health, can conduct basic laboratory analyses and interpret the results od basic composition of food.
	3,5	Student has basic abilities in aspects of impact of food and diet on human health, can conduct basic laboratory analyses and interpret the results od basic composition of food.
	4,0	Student has general abilities in aspects of impact of food and diet on human health, can conduct basic laboratory analyses and well interpret the results od basic composition of food.
	4,5	Student has advanced abilities in aspects of impact of food and diet on human health, can conduct basic laboratory analyses and well interpret the results od basic composition of food.
	5,0	Student has exellent abilities in aspects of impact of food and diet on human health, can conduct basic laboratory analyses and well interpret the results od basic composition of food.
Other social competences		
BT_2A_BTZ-A-D5_K01	*2,0*	Student does not show sufficient need to improve general and directional knowledge and discipline in individual work, avoids group work and can not plan own and team activities.
	3,0	Student shows sufficient need to improve general and directional knowledge and discipline in individual work, participates in group work and can plan own and team activities.
	3,5	Student shows more than sufficient need to improve general and directional knowledge and discipline in individual work, participates in group work and can plan own and team activities.
	4,0	Student shows a big need to improve general and directional knowledge and discipline in individual work, willingly participates in group work and can plan own and team activities.
	4,5	Student shows a big need to improve general and directional knowledge and discipline in individual work, willingly participates in group work and can well plan own and team activities.
	5,0	Student shows a great need to improve general and directional knowledge and discipline in individual work, willingly participates in group work and can plan exellent own and team activities.

Required reading
1. Julian E. Spallholz, Mallory Boylan, Judy A. Driskell., Nutrition: CHEMISTRY AND BIOLOGY, CRC Press, 1998, II, ISBN 0-8493-8504-0
2. Rudolf Steiner, Nutrition: Food, Health and Spiritual Development, Rudolf Steiner Press, 2006

Required reading

3. Susan Allport, The Queen of Fats: Why Omega-3s Were Removed from the Western Diet and What We Can Do to Replace Them, University of California Press, 2006

Supplementary reading

1. MJ, Lanham-New SA, Cassidy A, Vorster HH, Introduction to Human Nutrition, A John Wiley & Sons, Ltd., 2009

Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Faculty of Biotechnology and Animal Husbandry

Field of study	Biotechnology		
Mode of study	stacjonarna	*Level*	drugi
Graduate's qualification	magister inżynier		
Fields of study	dziedzina nauk ścisłych i przyrodniczych, dziedzina nauk rolniczych, dziedzina nauk inżynieryjno-technicznych		
Academic disciplines	nauki biologiczne (5%), technologia żywności i żywienia (10%), rolnictwo i ogrodnictwo (10%), inżynieria chemiczna (5%), inżynieria materiałowa (10%), zootechnika i rybactwo (60%)		
Educational profile	ogólnoakademicki		
Module			
Course unit	**Abiotic stress in environmental protection**		
Code	BT_2A_S_20/21_BTA-A-D6		
Field of specialisation	Biotechnology in animal production and environmental protection		
Administering faculty	Katedra Genetyki, Hodowli i Biotechnologii Roślin		
ECTS	2,0	*ECTS (forms)*	2,0
Form of course credit	zaliczenie	*Language*	angielski
Electives		*Elective group*	

Form of instruction	*Cod*	*Semester*	*Hours*	*ECTS*	*Weight*	*Credit*
laboratoria	L	3	15	1,0	0,41	zaliczenie
wykłady	W	3	15	1,0	0,59	zaliczenie

Leading teacher	Smolik Miłosz (Milosz.Smolik@zut.edu.pl)
Other teachers	Kołodziej-Skalska Anita (Anita.Kolodziej@zut.edu.pl)

Prerequisites

W-1	Wiedza z zakresu mikrobiologii, ochrony środowiska, podstaw biotechnologii środowiska i chemii.

Module/course unit objectives

C-1	Celem nauczania przedmiotu jest zapoznanie studentów z wpływem działalności człowieka na emisję zanieczyszczeń i ich wpływem na środowisko przyrodnicze oraz zaznajomienie z zastosowaniem najnowszych osiągnięć biotechnologii w zapobieganiu emisji i usuwaniu zanieczyszczeń ze środowiska.

Course content divided into various forms of instruction		*Number of hours*
T-L-1	Methods for taking, storing and preparing samples for laboratory analysis.	2
T-L-2	Assessment of selected indicators of water quality in the aspect of their biological protection. The influence of seasonality on the efficiency of self-cleaning water reservoirs. Use of alternative methods of water protection in practice.	3
T-L-3	Analysis of waste from selected branches of agri-food industry and assessment of its suitability for natural management.	2
T-L-4	Construction and principle of operation of soil-and-root sewage treatment plants using various examples. Evaluation of the effectiveness of nutrient removal in vertical and pziomal flow systems.	2
T-L-5	Assessment of biodegradability of waste from various branches of industry. Analysis of biodegradable packaging materials.	2
T-L-6	Characteristics and evaluation of ecological directions in agriculture (organic, integrated, biodynamic agriculture). Evaluation of methods to reduce the burden on the environment from animal production.	3
T-L-7	Summary and completion of exercises.	1
T-W-1	Introduction to the subject - new directions of biotechnology development in protection sustainable environments.	2
T-W-2	Contamination of the environment with heavy metals - sources of emissions and impact on living organisms.	2
T-W-3	Biotechnologies for removing metals from wastewater.	3
T-W-4	Microbiological leaching of metals from ores and industrial waste.	2
T-W-5	Biotechnologies for desulphurisation of coal and oil.	2
T-W-6	Polychlorinated biphenyls (PCBs) and dioxins in the environment and biotechnology for their disposal.	2
T-W-7	Biotechnology in agricultural production from the point of view of environmental protection.	2

Student workload - forms of activity		*Number of hours*
A-L-1	Participation in lectures.	15
A-L-2	Independent study of theory and methodical preparation to perform analysis.	10

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Faculty of Biotechnology and Animal Husbandry

Student workload - forms of activity		*Number of hours*
A-L-3	Preparation to pass the exercises.	5
A-W-1	Participation in lectures.	15
A-W-2	self-study of lectures.	10
A-W-3	Preparation to pass the lectures.	5

Teaching methods / tools	
M-1	Wykład informacyjny w postaci prezentacji multimedialnej
M-2	Ćwiczenia laboratoryjne

Evaluation methods (F - progressive, P - final)		
S-1	F	Zaliczenie praktyczne ćwiczeń laboratoryjnych
S-2	P	Zaliczenie w formie pisemnej wykładów i ćwiczeń

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6, 7 lub 8 PRK	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6 lub 7 umożliwiających uzyskanie kompetencji inżynierskich	Course objectives	Course content	Teaching methods	Evaluation methods
Knowledge							
BT_2A_BTZ-A-D6_W01 Student zna i charakteryzuje metody biotechnologiczne stosowane w zapobieganiu i liwidacji skażeń środowiska naturalnego.	BTap_2A_W10	P7S_WG		C-1	T-L-6 T-W-4 T-W-1 T-W-5 T-W-2 T-W-6 T-W-3 T-W-7	M-1	S-2
BT_2A_BTZ-A-D6_W02 Student zna metody oznaczeń chemicznych wybranych zanieczyszczeń.	BTap_2A_W08	P7S_WG	P7S_WG	C-1	T-L-1 T-L-4 T-L-2 T-L-5 T-L-3	M-2	S-1
Skills							
BT_2A_BTZ-A-D6_U01 Student umie dobrać i zastosować najnowsze osiągnięcia biotechnologii do ochrony i odnowy środowiska naturalnego. Umie oszacować korzyści ekologiczne ze stosowania biotechnologii.	BTap_2A_U04	P7S_UW		C-1	T-W-1 T-W-5 T-W-2 T-W-6 T-W-3 T-W-7 T-W-4	M-1	S-2
BT_2A_BTZ-A-D6_U02 Student potrafi zastosować odpowiednie metody laboratoryjne do oznaczeń wybranych zanieczyszczeń.	BTap_2A_U05	P7S_UK P7S_UO P7S_UU P7S_UW	P7S_UW	C-1	T-L-1 T-L-4 T-L-2 T-L-5 T-L-3	M-2	S-1
Social competences							
BT_2A_BTZ-A-D6_K01 Student kieruje się zasadą odpowiedzialności za stan środowiska naturalnego i wykazuje otwartość na nowe rozwiązania biotechnologiczne zmierzające do ochrony i odnowy srodowiska naturalnego.	BTap_2A_K03	P7S_KK P7S_KO		C-1	T-L-1 T-W-2 T-L-2 T-W-3 T-L-3 T-W-4 T-L-4 T-W-5 T-L-5 T-W-6 T-W-1 T-W-7	M-1 M-2	S-2

Outcomes	Grade	Evaluation criterion
Knowledge		
BT_2A_BTZ-A-D6_W01	*2,0*	Student nie zna i nie potrafi scharakteryzować metod biotechnologicznych stosowanych w zapobieganiu i liwidacji skażeń środowiska naturalnego.
	3,0	Student zna i charakteryzuje nieliczne poznane metody biotechnologiczne stosowane w zapobieganiu i liwidacji skażeń środowiska naturalnego.
	3,5	Student zna i charakteryzuje co najmniej 50% poznanych metod biotechnologicznych stosowanych w zapobieganiu i liwidacji skażeń środowiska naturalnego.
	4,0	Student zna i charakteryzuje większość poznanych metod biotechnologicznych stosowanych w zapobieganiu i liwidacji skażeń środowiska naturalnego.
	4,5	Student zna i charakteryzuje większość poznanych metod biotechnologicznych stosowanych w zapobieganiu i liwidacji skażeń środowiska naturalnego i uczestniczy w dyskusji.
	5,0	Student zna i charakteryzuje wszystkie poznane metody biotechnologiczne stosowane w zapobieganiu i liwidacji skażeń środowiska naturalnego i bierze aktywny udział w dyskusji.
BT_2A_BTZ-A-D6_W02	*2,0*	Student nie zna metod oznaczeń chemicznych wybranych zanieczyszczeń.
	3,0	Student zna niektóre metody oznaczeń chemicznych wybranych zanieczyszczeń.
	3,5	Student zna większość metod oznaczeń chemicznych wybranych zanieczyszczeń i przedstawia suche wyniki.
	4,0	Student dobrze zna metody oznaczeń chemicznych wybranych zanieczyszczeń przedstawia suche wyniki.
	4,5	Student zna dobrze metody oznaczeń chemicznych wybranych zanieczyszczeń i interpretuje uzyskane wyniki
	5,0	Student zna bardzo dobrze metody oznaczeń chemicznych wybranych zanieczyszczeń, interpretuje uzyskane wyniki i wyciąga wnioski

Skills		
BT_2A_BTZ-A-D6_U01	*2,0*	Student nie umie dobrać i nie potrafi zastosować najnowszych osiągnięć biotechnologii do ochrony i odnowy środowiska naturalnego. Nie umie oszacować korzyści ekologicznych ze stosowania biotechnologii.
	3,0	Student umie dobrać i potrafi zastosować niektóre osiągnięcia biotechnologii do ochrony i odnowy środowiska naturalnego. Nie umie oszacować korzyści ekologicznych ze stosowania biotechnologii.
	3,5	Student umie dobrać i potrafi zastosować większość poznanych osiągnięć biotechnologii do ochrony i odnowy środowiska naturalnego. Nie umie oszacować korzyści ekologicznych ze stosowania biotechnologii.
	4,0	Student umie dobrać i potrafi zastosować większość poznanych osiągnięć biotechnologii do ochrony i odnowy środowiska naturalnego. Umie oszacować korzyści ekologicznych ze stosowania biotechnologii.
	4,5	Student umie dobrać i potrafi zastosować większość poznanych osiągnięć biotechnologii do ochrony i odnowy środowiska naturalnego. Umie oszacować korzyści ekologicznych ze stosowania biotechnologii i potrafi dyskutować na dany temat.
	5,0	Student umie dobrać i potrafi zastosować wszystkie poznane osiągnięć biotechnologii do ochrony i odnowy środowiska naturalnego. Umie oszacować korzyści ekologicznych ze stosowania biotechnologii i potrafi dyskutować na dany temat.
BT_2A_BTZ-A-D6_U02	*2,0*	Student nie potrafi zastosować odpowiednich metod laboratoryjnych do oznaczeń wybranych zanieczyszczeń.
	3,0	Student potrafi zastosować niektóre metody laboratoryjne do oznaczeń wybranych zanieczyszczeń.
	3,5	Student potrafi zastosować 50% poznanych metod laboratoryjnych do oznaczeń wybranych zanieczyszczeń.
	4,0	Student potrafi zastosować większość poznanych metod laboratoryjnych do oznaczeń wybranych zanieczyszczeń.
	4,5	Student potrafi zastosować większość poznanych metod laboratoryjnych do oznaczeń wybranych zanieczyszczeń i interpretuje uzyskane wyniki
	5,0	Student potrafi doskonale zastosować poznane metody laboratoryjne do oznaczeń wybranych zanieczyszczeń, interpretuje uzyskane wyniki i odnosi je do zagrożeń środowiska
Other social competences		
BT_2A_BTZ-A-D6_K01	*2,0*	Student nie kieruje się zasadą odpowiedzialności za stan środowiska naturalnego i nie wykazuje otwartości na nowe rozwiązania biotechnologiczne zmierzające do ochrony i odnowy srodowiska naturalnego.
	3,0	Student w stopniu dostatecznym kieruje się zasadą odpowiedzialności za stan środowiska naturalnego, ale nie wykazuje otwartości na nowe rozwiązania biotechnologiczne zmierzające do ochrony i odnowy srodowiska naturalnego.
	3,5	Student w stopniu dostatecznym kieruje się zasadą odpowiedzialności za stan środowiska naturalnego i na poziomie dostatecznym wykazuje otwartość na nowe rozwiązania biotechnologiczne zmierzające do ochrony i odnowy srodowiska naturalnego.
	4,0	Student na poziomie dobrym kieruje się zasadą odpowiedzialności za stan środowiska naturalnego i na poziomie dobrym wykazuje otwartość na nowe rozwiązania biotechnologiczne zmierzające do ochrony i odnowy srodowiska naturalnego.
	4,5	Student na poziomie dobrym kieruje się zasadą odpowiedzialności za stan środowiska naturalnego i na poziomie dobrym wykazuje otwartość na nowe rozwiązania biotechnologiczne zmierzające do ochrony i odnowy srodowiska naturalnego oraz wyraża opinię w danym temacie.
	5,0	Student kieruje się zasadą pełnej odpowiedzialności za stan środowiska naturalnego i wykazuje pełną otwartość na nowe rozwiązania biotechnologiczne zmierzające do ochrony i odnowy srodowiska naturalnego oraz wyraża opinię w danym temacie.

Required reading

1. Klimiuk E., Łebkowska M.,, Biotechnologia w ochronie środowiska, PWN, Warszawa, 2004

2. Falandysz J.,, Polichlorowane bifenyle (PCBs) w środowisku: Chemia, Analiza, Toksyczność, Stężenia i Ocena Ryzyka., Gdańsk, 1999

3. Błaszczyk M.,, Mikroorganizmy w ochronie środowiska, PWN, Warszawa, 2007

4. Wojnowska-Baryła I.,, Trendy w biotechnologii środowiskowej, Uniwersytet Warmińsko-Mazurski, Olsztyn, 2008

5. Pullin A. S.,, Biologiczne podstawy ochrony przyrody, PWN, Warszawa, 2007

6. Nawrocki J., Biłozora S.,, Uzdatnianie wody-procesy chemiczne i biologiczne, PWN, Warszawa, 2000

Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Faculty of Biotechnology and Animal Husbandry

Field of study	Biotechnology		
Mode of study	stacjonarna	*Level*	drugi
Graduate's qualification	magister inżynier		
Fields of study	dziedzina nauk ścisłych i przyrodniczych, dziedzina nauk rolniczych, dziedzina nauk inżynieryjno-technicznych		
Academic disciplines	nauki biologiczne (5%), technologia żywności i żywienia (10%), rolnictwo i ogrodnictwo (10%), inżynieria chemiczna (5%), inżynieria materiałowa (10%), zootechnika i rybactwo (60%)		
Educational profile	ogólnoakademicki		
Module			
Course unit	**Genetic responses to environmental change**		
Code	BT_2A_S_20/21_BTA-A-D7		
Field of specialisation	Biotechnology in animal production and environmental protection		
Administering faculty	Katedra Genetyki i Ogólnej Hodowli Zwierząt		
ECTS	3,0	*ECTS (forms)*	3,0
Form of course credit	zaliczenie	*Language*	angielski
Electives		*Elective group*	

Form of instruction	*Cod*	*Semester*	*Hours*	*ECTS*	*Weight*	*Credit*
ćwiczenia audytoryjne	A	2	10	1,0	0,29	zaliczenie
laboratoria	L	2	10	1,0	0,29	zaliczenie
wykłady	W	2	10	1,0	0,42	zaliczenie

Leading teacher	Terman Arkadiusz (Arkadiusz.Terman@zut.edu.pl)
Other teachers	

Prerequisites	
W-1	Basic knowlegde in the field of genetics.
W-2	Basic knowledge in the field of genetic engineering.

Module/course unit objectives	
C-1	The aim of the course is to familiarize students with the posssibilities of using genetic engineering in animal breeding.

Course content divided into various forms of instruction		*Number of hours*
T-A-1	Teory of molecular evolution.	2
T-A-2	Maintaining genetic diversity in small and large populations/	2
T-A-3	Methods of using gene therapy.	2
T-A-4	Methods of DNA isolation and its use in the analysis of species diversity.	2
T-A-5	Gene banks of animal species threatened in Poland.	2
T-L-1	Genetic tests - types and efficacy.	4
T-L-2	Methods of genetic bioeqivalence assessment.	2
T-L-3	Analysis of factiors threatening genetic diversity.	2
T-L-4	Genetic variation.	2
T-W-1	Effect of mytagens on genetic material	2
T-W-2	The impact of the organism environment for genotype.	2
T-W-3	Gene and chromosomal mutations as basic source of variability.	2
T-W-4	Xenotranspllantation - positive and negative effects.	2
T-W-5	GMO - chances and dangers.	2

Student workload - forms of activity		*Number of hours*
A-A-1	Participation in clesses.	10
A-A-2	Preparation of the presentation.	20
A-L-1	Participation in laboratory.	10
A-L-2	Preparing the student for classes.	15
A-L-3	Practical pass.	5

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Faculty of Biotechnology and Animal Husbandry

Student workload - forms of activity		*Number of hours*
A-W-1	Participation in lectures.	10
A-W-2	Independent study of lecture topics.	5
A-W-3	Preparing the student for a test	15

Teaching methods / tools	
M-1	Multimedia presentations.
M-2	Work in groups.

Evaluation methods (F - progressive, P - final)		
S-1	F	Evaluation of activities at classes.
S-2	F	Evaliation of preparation multimedia presentation.
S-3	F	Written test.
S-4	P	Comprehensive assessment of student activity.
S-5	P	Written exam.

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6, 7 lub 8 PRK	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6 lub 7 umożliwiających uzyskanie kompetencji inżynierskich	Course objectives	Course content	Teaching methods	Evaluation methods
Knowledge							
BT_2A_BTZ-A-D7_W01 Student potrafi wskazać potencjalne kierunki wykorzystywania zwierząt transgenicznych we współczesnej biotechnologii.	BTap_2A_W01 BTap_2A_W14	P7S_WG		C-1	T-W-1 T-W-3 T-W-2 T-W-5	M-1 M-2	S-4 S-5
BT_2A_BTZ-A-D7_W02 Student jest świadomy zagrożeń oraz fizjologicznych konsekwencji związanych z uzyskiwaniem zwierząt transgenicznych i klonowaniem ich w celu wyprodukowania potencjalnych dawców narządów do transplantacji.	BTap_2A_W06	P7S_WG			T-W-4	M-1 M-2	S-4 S-5
Skills							
BT_2A_BTZ-A-D7_U01 Student potrafi ocenić negatywny wpływ manipulacji genetycznych na funkcjonowanie organizmu żywego.	BTap_2A_U04	P7S_UW		C-1	T-W-2 T-W-4 T-W-3 T-W-5	M-1 M-2	S-4 S-5
BT_2A_BTZ-A-D7_U02 Student potrafi scharakteryzować obowiązujace we współczesnej biotechnologii kierunki modyfikacji organizmów.	BTap_2A_U08	P7S_UW	P7S_UW	C-1	T-W-2 T-W-4 T-W-3 T-W-5	M-1 M-2	S-4 S-5
Social competences							
BT_2A_BTZ-A-D7_K01 Rozumie w jaki sposób manipulacje genetyczne mogą wpłynąć na procesy fizjologiczne organizmu.	BTap_2A_K02	P7S_KK			T-W-1 T-W-4 T-W-2 T-W-5 T-W-3	M-1 M-2	S-1 S-2 S-3
BT_2A_BTZ-A-D7_K02 Student rozumie potrzebę rozwijania własnych kompetencji zawodowych i jest otwarty na wymianę wiedzy w kontaktach interpersonalnych.	BTap_2A_K01 BTap_2A_K07	P7S_KK P7S_KO P7S_KR		C-1	T-W-1 T-W-4 T-W-2 T-W-5 T-W-3	M-1 M-2	S-1 S-2
BT_2A_BTZ-A-D7_K03 Wykazuje zdyscyplinowanie w pracy zespołowej, jednocześnie potrafi organizować i kierować pracą w grupie.	BTap_2A_K05	P7S_KO P7S_KR		C-1	T-W-1 T-W-4 T-W-2 T-W-5 T-W-3	M-1 M-2	S-1 S-2

Outcomes	Grade	Evaluation criterion
Knowledge		
BT_2A_BTZ-A-D7_W01	*2,0*	- nie potrafi zdefiniować podstawowych pojęć - w zakresie stosunku do wiedzy wykazuje obojętność - w zakresie wyrażania wiedzy popełnia bardzo dużo błędów merytorycznych
	3,0	- w zakresie wiedzy opanował podstawowy materiał programowy - w zakresie opanowania wiedzy przyswoił zasadnicze treści programowe - w zakresie stosunku do wiedzy wykazuje średnie zainteresowanie - w zakresie wyrażania wiedzy popełnia wiele błędów
	3,5	- w zakresie wiedzy opanował podstawowy materiał programowy - wykazuje zrozumienie podstawowych zagadnień - w zakresie opanowania wiedzy przyswoił zasadnicze treści programowe - w zakresie stosunku do wiedzy wykazuje średnie zainteresowanie - w zakresie wyrażania wiedzy popełnia wiele błędów
	4,0	- w zakresie wiedzy opanował prawie cały materiał programowy - w zakresie rozumienia wiedzy opanował poprawnie cały zakresu materiału - w zakresie opanowania wiedzy przyswoił zasadnicze treści programowe prawie dokładnie - w zakresie stosunku do wiedzy wykazuje duże zainteresowanie - w zakresie wyrażania wiedzy popełnia sporadycznie błędy
	4,5	- w zakresie wiedzy opanował cały materiał programowy - w zakresie rozumienia wiedzy opanował wszystkie treści programowe - w zakresie stosunku do wiedzy wykazuje duże zainteresowanie - w zakresie wyrażania wiedzy nie popełnia błędów
	5,0	- w zakresie wiedzy wykracza poza materiał programowy - w zakresie rozumienia wiedzy opanował wszystkie treści programowe - w zakresie stosunku do wiedzy wykazuje duże zainteresowanie i ciekawość poznawczą - w zakresie wyrażania wiedzy nie popełnia błędów

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Knowledge		
BT_2A_BTZ-A-D7_W02	*2,0*	- nie potrafi zdefiniować podstawowych pojęć - w zakresie stosunku do wiedzy wykazuje obojętność - w zakresie wyrażania wiedzy popełnia bardzo dużo błędów merytorycznych
	3,0	- w zakresie wiedzy opanował podstawowy materiał programowy - w zakresie opanowania wiedzy przyswoił zasadnicze treści programowe - w zakresie stosunku do wiedzy wykazuje średnie zainteresowanie - w zakresie wyrażania wiedzy popełnia wiele błędów
	3,5	- w zakresie wiedzy opanował podstawowy materiał programowy - wykazuje zrozumienie podstawowych zagadnień - w zakresie opanowania wiedzy przyswoił zasadnicze treści programowe - w zakresie stosunku do wiedzy wykazuje średnie zainteresowanie - w zakresie wyrażania wiedzy popełnia wiele błędów
	4,0	- w zakresie wiedzy opanował prawie cały materiał programowy - w zakresie rozumienia wiedzy opanował poprawnie cały zakresu materiału - w zakresie opanowania wiedzy przyswoił zasadnicze treści programowe prawie dokładnie - w zakresie stosunku do wiedzy wykazuje duże zainteresowanie - w zakresie wyrażania wiedzy popełnia sporadycznie błędy
	4,5	- w zakresie wiedzy opanował cały materiał programowy - w zakresie rozumienia wiedzy opanował wszystkie treści programowe - w zakresie stosunku do wiedzy wykazuje duże zainteresowanie - w zakresie wyrażania wiedzy nie popełnia błędów
	5,0	- w zakresie wiedzy wykracza poza materiał programowy - w zakresie rozumienia wiedzy opanował wszystkie treści programowe - w zakresie stosunku do wiedzy wykazuje duże zainteresowanie i ciekawość poznawczą - w zakresie wyrażania wiedzy nie popełnia błędów
Skills		
BT_2A_BTZ-A-D7_U01	*2,0*	Student: nie potrafi poradzić sobie samodzielnie z trudnościami mogącymi pojawić się na każdym z etapów przygotowanie zleconej pracy, nie operuje wiedzą kontekstową.
	3,0	Student: radzi sobie, z dużą pomocą nauczyciela, z wybranymi trudnościami związanymi z procesem przygotowania zleconej pracy
	3,5	Student: potrafi poradzić sobie, z nieznaczną pomocą nauczyciela, z wybranymi trudnościami związanymi z procesem przygotowania zleconej pracy.
	4,0	Student: samodzielnie radzi sobie z podstawowymi trudnościami związanymi z procesem wykonania zleconej pracy
	4,5	Student: samodzielnie rozwiązuje postawione problemy i radzi sobie z trudnościami związanymi z procesem wykonania zleconej pracy
	5,0	Student: samodzielnie rozwiązuje postawione problemy i radzi sobie w pełni z trudnościami związanymi z procesem wykonania zleconej pracy; swobodnie porusza się w danej tematyce i prawidłowo wykorzystuje materiały źródłowe
BT_2A_BTZ-A-D7_U02	*2,0*	Student: nie potrafi poradzić sobie samodzielnie z trudnościami mogącymi pojawić się na każdym z etapów przygotowanie zleconej pracy, nie operuje wiedzą kontekstową.
	3,0	Student: radzi sobie, z dużą pomocą nauczyciela, z wybranymi trudnościami związanymi z procesem przygotowania zleconej pracy
	3,5	Student: potrafi poradzić sobie, z nieznaczną pomocą nauczyciela, z wybranymi trudnościami związanymi z procesem przygotowania zleconej pracy.
	4,0	Student: samodzielnie radzi sobie z podstawowymi trudnościami związanymi z procesem wykonania zleconej pracy
	4,5	Student: samodzielnie rozwiązuje postawione problemy i radzi sobie z trudnościami związanymi z procesem wykonania zleconej pracy
	5,0	Student: samodzielnie rozwiązuje postawione problemy i radzi sobie w pełni z trudnościami związanymi z procesem wykonania zleconej pracy; swobodnie porusza się w danej tematyce i prawidłowo wykorzystuje materiały źródłowe
Other social competences		
BT_2A_BTZ-A-D7_K01	*2,0*	
	3,0	
	3,5	
	4,0	
	4,5	
	5,0	
BT_2A_BTZ-A-D7_K02	*2,0*	
	3,0	
	3,5	
	4,0	
	4,5	
	5,0	
BT_2A_BTZ-A-D7_K03	*2,0*	
	3,0	
	3,5	
	4,0	
	4,5	
	5,0	

Required reading
1. Virginia Evans, Jenny Dooley, Elizabeth Norton (PhD), Genetic Engineering. Student's Book, Express Publishing, 1998

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Field of study	Biotechnology		
Mode of study	stacjonarna	*Level*	drugi
Graduate's qualification	magister inżynier		
Fields of study	dziedzina nauk ścisłych i przyrodniczych, dziedzina nauk rolniczych, dziedzina nauk inżynieryjno-technicznych		
Academic disciplines	nauki biologiczne (5%), technologia żywności i żywienia (10%), rolnictwo i ogrodnictwo (10%), inżynieria chemiczna (5%), inżynieria materiałowa (10%), zootechnika i rybactwo (60%)		
Educational profile	ogólnoakademicki		
Module			
Course unit	**Enzyme engineering**		
Code	BT_2A_S_20/21_BTA-A-D8		
Field of specialisation	Biotechnology in animal production and environmental protection		
Administering faculty	Katedra Immunologii, Mikrobiologii i Chemii Fizjologicznej		
ECTS	4,0	*ECTS (forms)*	4,0
Form of course credit	egzamin	*Language*	angielski
Electives		*Elective group*	

Form of instruction	*Cod*	*Semester*	*Hours*	*ECTS*	*Weight*	*Credit*
ćwiczenia audytoryjne	A	3	15	1,0	0,29	zaliczenie
laboratoria	L	3	15	1,0	0,29	zaliczenie
wykłady	W	3	15	2,0	0,42	egzamin

Leading teacher	Drozd Radosław (Radoslaw.Drozd@zut.edu.pl)
Other teachers	

Prerequisites	
W-1	The basic knowledge of organic and inorganic chemistry, biochemistry, biophysics, physical chemistry, English at intermediate level

Module/course unit objectives	
C-1	Familiarize the students with the basics methods of the proteins engineering for modifying the catalytic activity of enzymes
C-2	Introduction to methods of in silico prediction of protein structures
C-3	Mastering the skills of the selection of appropriate methods for enzyme immobilization

Course content divided into various forms of instruction		*Number of hours*
T-A-1	The industrial application of the enzymes from the oxidoreductase classes	2
T-A-2	The industrial application of the enzymes from the transferase classes	2
T-A-3	The industrial application of the enzymes from the hydrolase classes	2
T-A-4	The industrial application of the enzymes from the lyase classes	2
T-A-5	The industrial application of the enzymes from the isomerase classes	2
T-A-6	The industrial application of the enzymes from the ligase classe	2
T-A-7	Optimization of the properties of enzymes for use in industrial processes	3
T-L-1	Methods of visualization of protein structures with using the specialized software for molecular modeling	2
T-L-2	The computational methods for protein structure determination on the their second and third level organizationji	4
T-L-3	Modeling the catalytic properties of the enzymes	2
T-L-4	Methods of the enzymes isolation and purification	2
T-L-5	Methods for the immobilization of enzymes on the organic and inorganic matrices	5
T-W-1	The function and significance of the structure of enzymes. The impact amino acid molecular interaction on the stabilization the structure of enzymatic proteins. Methods for the analysis of the primary structure of the enzyme proteins. Methods for the analysis of secondary and tertiary level structure of the enzyme proteins	2
T-W-2	The methods of exploring structural and sequence protein databases. The specialist molecular modeling software; practical approach to the comparison of the structure I, II and III the order of the enzymes. Methods of solving the 3D structure of enzymes. Classical methods (X-ray, NMR) vs. comparative modeling and ab-initio methods	2
T-W-3	Catalytic properties of enzymes. Methods of the in-vitro study of the enzymes active site properities	2

Course content divided into various forms of instruction		*Number of hours*
T-W-4	Modeling and optimization of kinetic parameters of enzymes. Prediction and design the catalytic properties of enzymes by in-silico methods.	2
T-W-5	The methods of the immobilisation and stabilisation the enzymes. The purification and isolation of the enzyme from different sources	2
T-W-6	Microbial production of enzymes with different properties. Types of fermentation processes. Design and optimization of bioreactors for the production of the enzymes on an industrial scale	2
T-W-7	The enzymes in food and pharmaceutical industries. The enzymes in the textile and material	2
T-W-8	The application of enzymes in environmental remediation and fuel production from renewable sources. he application of enzyme in the household	1

Student workload - forms of activity		*Number of hours*
A-A-1	participation in classes	15
A-A-2	preparation for classes	5
A-A-3	reading the indicated literature	10
A-L-1	participation in classes	15
A-L-2	preparation for laboratory classes	10
A-L-3	reading the indicated literature	5
A-W-1	preparation for course passing	15
A-W-2	participation in classes	15
A-W-3	reading the indicated literature	5
A-W-4	preparation for classes	10
A-W-5	contact hours	15

Teaching methods / tools	
M-1	information lecture
M-2	narrative lectures
M-3	anecdote
M-4	conversational lecture

Evaluation methods (F - progressive, P - final)		
S-1	P	Written exam, test
S-2	F	Report from laboratory classes Multimedia presentation

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6, 7 lub 8 PRK	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6 lub 7 umożliwiających uzyskanie kompetencji inżynierskich	Course objectives	Course content	Teaching methods	Evaluation methods
Knowledge							
BT_2A_BTZ-A-D8_W01 Student has a knowledge of the scope of structural dependencies shaping the catalytic properties of enzymes. Student knows bioinforamtics tools that allow prediction of the enzyme structure.	BTap_2A_W09	P7S_WG	P7S_WG	C-1 C-2 C-3	T-L-2 T-L-3	M-1 M-2 M-3 M-4	S-1 S-2
BT_2A_BTZ-A-D8_W02 Student knows the methods of enzyme immobilization and methods preparation of highly purified enzyme preparations.	BTap_2A_W09	P7S_WG	P7S_WG	C-1 C-2 C-3	T-L-4 T-W-4 T-L-5 T-W-5 T-W-1	M-1 M-2 M-3 M-4	S-1 S-2
BT_2A_BTZ-A-D8_W03 Student knows the methods of selection of microorganisms for application tasks aimed at the production of species with specific catalytic activity	BTap_2A_W09	P7S_WG	P7S_WG	C-1 C-2 C-3	T-A-1 T-A-7 T-A-2 T-L-5 T-A-3 T-W-5 T-A-4 T-W-6 T-A-5 T-W-8 T-A-6	M-1 M-2 M-3 M-4	S-1 S-2
Skills							
BT_2A_BTZ-A-D8_U01 Student use bioinformatic tools to solve the enzyme structure, is able to gain dependence between their structure and catalytic functions	BTap_2A_U07	P7S_UW		C-1 C-2 C-3	T-L-1 T-W-4 T-L-2 T-W-5 T-L-3	M-1 M-2 M-3 M-4	S-2
BT_2A_BTZ-A-D8_U02 Student analyze methods that allow enzyme immoblizations, calculates the possibilities of their application in specific applications	BTap_2A_U07	P7S_UW		C-1 C-2 C-3	T-A-7 T-W-5 T-L-5 T-W-6 T-W-4 T-W-7	M-1 M-2 M-3 M-4	S-1 S-2
Social competences							
BT_2A_BTZ-A-D8_K01 Student knows and uses biotechnology methods to improve the quality of life for himself and others	BTap_2A_K02 BTap_2A_K03 BTap_2A_K04	P7S_KK P7S_KO P7S_KR		C-1 C-2 C-3	T-A-7 T-W-8	M-1 M-2 M-3 M-4	S-1 S-2

Outcomes	Grade	Evaluation criterion
Knowledge		
BT_2A_BTZ-A-D8_W01	*2,0*	
	3,0	Preparation of a multimedia presentation, participation in 90% of auditory classes, Correct answer to 60% of test questions - exam
	3,5	
	4,0	
	4,5	
	5,0	
BT_2A_BTZ-A-D8_W02	*2,0*	
	3,0	Preparation of a multimedia presentation, participation in 90% of auditory classes, Correct answer to 60% of test questions - exam
	3,5	
	4,0	
	4,5	
	5,0	
BT_2A_BTZ-A-D8_W03	*2,0*	
	3,0	Preparation of a multimedia presentation, participation in 90% of auditory classes, Correct answer to 60% of test questions - exam
	3,5	
	4,0	
	4,5	
	5,0	
Skills		
BT_2A_BTZ-A-D8_U01	*2,0*	
	3,0	Preparation of a multimedia presentation, participation in 90% of auditory classes, Correct answer to 60% of test questions - exam
	3,5	
	4,0	
	4,5	
	5,0	
BT_2A_BTZ-A-D8_U02	*2,0*	
	3,0	Preparation of a multimedia presentation, participation in 90% of auditory classes, Correct answer to 60% of test questions - exam
	3,5	
	4,0	
	4,5	
	5,0	
Other social competences		
BT_2A_BTZ-A-D8_K01	*2,0*	
	3,0	Preparation of a multimedia presentation, participation in 90% of auditory classes, Correct answer to 60% of test questions - exam
	3,5	
	4,0	
	4,5	
	5,0	

Required reading

1. Yoo, Y.J., Feng, Y., Kim, Y.-H., Yagonia, C., Fundamentals of Enzyme Engineering, Springer Netherlands, 2017

2. Wolfgang Aehle red., Enzymes in Industry: Production and Applications, Willey VCH, 2007, III

3. Allan Svendsen, Enzyme Functionality: Design, Engineering and Screening, 2004

4. Christoph Wittmann i Rainer Krull red., Biosystems Engineering I: Creating Superior Biocatalysts, Tom 1, Springer, 2010

5. Girish Shukla i Ajit Varma, Soil Enzymology, Springer, 2011

Supplementary reading

1. Athel Cornish-Bowden, Fundamentals of Enzyme Kinetics, Portland Press, Londyn, 2002, III

Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Faculty of Biotechnology and Animal Husbandry

Field of study	Biotechnology		
Mode of study	stacjonarna	*Level*	drugi
Graduate's qualification	magister inżynier		
Fields of study	dziedzina nauk ścisłych i przyrodniczych, dziedzina nauk rolniczych, dziedzina nauk inżynieryjno-technicznych		
Academic disciplines	nauki biologiczne (5%), technologia żywności i żywienia (10%), rolnictwo i ogrodnictwo (10%), inżynieria chemiczna (5%), inżynieria materiałowa (10%), zootechnika i rybactwo (60%)		
Educational profile	ogólnoakademicki		
Module			
Course unit	**Biological methods assessment of environment quality**		
Code	BT_2A_S_20/21_BTA-A-D9		
Field of specialisation	Biotechnology in animal production and environmental protection		
Administering faculty	Katedra Biotechnologii Rozrodu Zwierząt i Higieny Środowiska		
ECTS	2,0	*ECTS (forms)*	2,0
Form of course credit	zaliczenie	*Language*	angielski
Electives		*Elective group*	

Form of instruction	*Cod*	*Semester*	*Hours*	*ECTS*	*Weight*	*Credit*
ćwiczenia audytoryjne	A	3	15	1,0	0,41	zaliczenie
wykłady	W	3	15	1,0	0,59	zaliczenie

Leading teacher	Tomza-Marciniak Agnieszka (Agnieszka.Tomza-Marciniak@zut.edu.pl)
Other teachers	Pilarczyk Bogumiła (Bogumila.Pilarczyk@zut.edu.pl)

Prerequisites	
W-1	It is required knowledge in areas of ecology and environmental protection.

Module/course unit objectives	
C-1	Familiarizing students with the biological methods used in the assessment of environmental pollution degree.
C-2	To familiarize students with the importance of bioassays as a source of information about the interactions of pollutants and their effects on biotic components of ecosystems.
C-3	The acquisition of skills involving select the appropriate methods to assess enviromental quality.

Course content divided into various forms of instruction		*Number of hours*
T-A-1	Biological tests used in the environmental samples toxicity assessment.	2
T-A-2	An analysis of dependence the toxicity of water samples / bottom sediments and the concentrations of selected groups of contaminants.	2
T-A-3	Method for setting safe pollutant concentrations for aquatic biocoenoses.	2
T-A-4	The use of biological monitoring, epidemiological data and an environmental monitoring in the population health risk assessment.	6
T-A-5	Biodegradation tests. The objectives of biodegradation testing of chemical compounds (attestation, forecasting capabilities and the course of the chemical compounds elimination, determination NDS).	2
T-A-6	Evaluation of environmental mutagenesis.	1
T-W-1	Biological methods to control the quality of the environment.	2
T-W-2	Biological monitoring as a tool for the evaluation of occupational and environmental exposure to chemical and physical factors.	2
T-W-3	Biological markers in the assessment of exposure to environmental pollution. The role of biological markers in identifying hazards and physiological effects of exposure to environmental pollution (endemic and occupational exposure).	2
T-W-4	Environmental monitoring - methods for assessing environmental contamination and toxicity of the water, sediment, soil and air. An inhalation tests using mammals.	2
T-W-5	The use of ecological tolerance in the environment quality assessment.	2
T-W-6	Evaluation of mutagenicity and carcinogenicity of outdoor air pollution and water.	2
T-W-7	Biological tests versus chemical analytics. Overview of commercial tests used in the environmental quality control.	3

Student workload - forms of activity		*Number of hours*
A-A-1	participation in lectures	15

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Student workload - forms of activity		*Number of hours*
A-A-2	studying indicated literature	5
A-A-3	preparation for test	10
A-W-1	participation in lectures	15
A-W-2	studying indicated literature	8
A-W-3	preparation for test	7

Teaching methods / tools	
M-1	Delivery method, lecture/presentation
M-2	Discussion
M-3	Explanation

Evaluation methods (F - progressive, P - final)		
S-1	P	test
S-2	F	continuous assessment

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6, 7 lub 8 PRK	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6 lub 7 umożliwiających uzyskanie kompetencji inżynierskich	Course objectives	Course content	Teaching methods	Evaluation methods
Knowledge							
BT_2A_BTZ-A-D9_W01 The student knows monitor and indicator organisms and biomarkers used in the environmental assessment and testing toxicity.	BTap_2A_W12	P7S_WG		C-1	T-A-1 T-W-2 T-A-2 T-W-3 T-A-3 T-W-4 T-A-4 T-W-5 T-A-5 T-W-6 T-A-6 T-W-7 T-W-1	M-1 M-2 M-3	S-1
BT_2A_BTZ-A-D9_W02 Student specifies the basic commercial tests used in environmental quality control.	BTap_2A_W12	P7S_WG		C-2	T-W-7	M-1 M-2 M-3	S-1
Skills							
BT_2A_BTZ-A-D9_U01 Student proposes the use specified methodologies to assess the quality of the indicated elements of environment.	BTap_2A_U05 BTap_2A_U09	P7S_UK P7S_UO P7S_UU P7S_UW	P7S_UW	C-1	T-A-1 T-W-2 T-A-2 T-W-3 T-A-3 T-W-4 T-A-4 T-W-5 T-A-5 T-W-6 T-A-6 T-W-7 T-W-1	M-1 M-3	S-1
Social competences							
BT_2A_BTZ-A-D9_K01 The student demonstrates an active engagement with solving the identified problems.	BTap_2A_K05	P7S_KO P7S_KR		C-1	T-A-1 T-W-4 T-A-2 T-W-5 T-W-1 T-W-6 T-W-2 T-W-7 T-W-3	M-1 M-3	S-2

Outcomes	Grade	Evaluation criterion
Knowledge		
BT_2A_BTZ-A-D9_W01	*2,0*	
	3,0	Student lists and describes: the biological methods used in assessing of air, water and soil quality; indicators, monitors and biomarkers used in the assessment of environmental quality and toxicity tests.
	3,5	
	4,0	
	4,5	
	5,0	
BT_2A_BTZ-A-D9_W02	*2,0*	
	3,0	Student lists most of (mentioned in class) commercial tests used in environmental quality control.
	3,5	
	4,0	
	4,5	
	5,0	
Skills		

Skills		
BT_2A_BTZ-A-D9_U01	*2,0*	
	3,0	Student proposes to use the appropriate methods to assess the environmental quality.
	3,5	
	4,0	
	4,5	
	5,0	
Other social competences		
BT_2A_BTZ-A-D9_K01	*2,0*	
	3,0	The student demonstrates an engagement with solving the identified problems but does not engage spontaneously.
	3,5	
	4,0	
	4,5	
	5,0	

Required reading

1. Traczewska T., Biologiczne metody oceny skazenia srodowiska, Wyd. Politechniki Wrocławskiej, Wrocław, 2011

2. Hoffman D.J., Rattner B.A, Barton G.A., Cairns J., Handbook of ecotoxicology, Lewis Publishers, London, 2000

3. Kovacs M (ed), Biological indicators in environmental protection, Ellis Horwood, New York, 1992

Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Faculty of Biotechnology and Animal Husbandry

Field of study	Biotechnology		
Mode of study	stacjonarna	*Level*	drugi
Graduate's qualification	magister inżynier		
Fields of study	dziedzina nauk ścisłych i przyrodniczych, dziedzina nauk rolniczych, dziedzina nauk inżynieryjno-technicznych		
Academic disciplines	nauki biologiczne (5%), technologia żywności i żywienia (10%), rolnictwo i ogrodnictwo (10%), inżynieria chemiczna (5%), inżynieria materiałowa (10%), zootechnika i rybactwo (60%)		
Educational profile	ogólnoakademicki		
Module			
Course unit	**Medical microbiology**		
Code	BT_2A_S_20/21_BTA-A-O1.1		
Field of specialisation	Biotechnology in animal production and environmental protection		
Administering faculty	Katedra Immunologii, Mikrobiologii i Chemii Fizjologicznej		
ECTS	3,0	*ECTS (forms)*	3,0
Form of course credit	zaliczenie	*Language*	angielski
Electives	4	*Elective group*	

Form of instruction	*Cod*	*Semester*	*Hours*	*ECTS*	*Weight*	*Credit*
ćwiczenia audytoryjne	A	2	15	1,5	0,41	zaliczenie
wykłady	W	2	15	1,5	0,59	zaliczenie

Leading teacher	Fijałkowski Karol (karol.fijalkowski@zut.edu.pl)
Other teachers	

Prerequisites	
W-1	microbiology and immunology

Module/course unit objectives	
C-1	The course aims are to provide a comprehensive theoretical and practical knowledge of medical microbiology and to provide students with the latest information in scientific microbiology.

Course content divided into various forms of instruction		*Number of hours*
T-A-1	Practical information about working in clinical microbiological laboratory and preparing and storage of culture media;	2
T-A-2	Microscopic examination of microorganisms - procedures for preparing bacterial smears and stainings.	2
T-A-3	Detection and identification of various kind of human pathogens.	2
T-A-4	Determination of antibiotic susceptibility of human pathogenic bacteria.	2
T-A-5	Identification of virulence factors produced by human pathogenic bacteria.	2
T-A-6	Molecular diagnostics of microorganisms – PCR based techniques.	2
T-A-7	Isolation and identification of microorganisms from clinical samples and determination of their quantity.	2
T-A-8	Isolations of pure bacteria from a mix culture.	1
T-W-1	Methods for determination and controlling bacterial growth.	3
T-W-2	Conditions of bacterial cultures.	2
T-W-3	Study of biochemical activity of microorganisms.	2
T-W-4	Human pathogens	2
T-W-5	Resistance to antibiotics of human pathogenic bacteria.	2
T-W-6	Vrulence factors produced by human pathogens.	2
T-W-7	Diagnostic methods used for identyfication of human pathogenic microorganisms.	2

Student workload - forms of activity		*Number of hours*
A-A-1	participation in the course	15
A-A-2	preparing for classes	15
A-A-3	independent study of theory necessary to carry out the classes.	15
A-W-1	participation in the course	15
A-W-2	preparing to exams	15

Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Faculty of Biotechnology and Animal Husbandry

Student workload - forms of activity		*Number of hours*
A-W-3	independent study of lectures	15

Teaching methods / tools	
M-1	Lectures supported by multimedia presentations
M-2	Discussion
M-3	Practical work

Evaluation methods (F - progressive, P - final)		
S-1	F	Control of proper operation during the laboratory classes.
S-2	F	Written test of lectures and exercises.
S-3	F	Preparation of the multimedia presentation.

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6, 7 lub 8 PRK	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6 lub 7 umożliwiających uzyskanie kompetencji inżynierskich	Course objectives	Course content	Teaching methods	Evaluation methods
Knowledge							
BT_2A_BTZ-A-O1.1_W01 The student knows microbial identification techniques used in microbiological diagnostic laboratory.	BTap_2A_W08	P7S_WG	P7S_WG	C-1	T-A-2 T-A-4 T-A-3 T-A-6	M-1	S-2
Skills							
BTap_2A_BTA-A-O1.1_U01 The student uses appropriate methods and techniques to identify microorganisms.	BTap_2A_U05	P7S_UK P7S_UO P7S_UU P7S_UW	P7S_UW	C-1	T-A-2 T-W-2 T-A-3 T-W-3 T-W-1 T-W-7	M-1 M-2 M-3	S-1 S-3
Social competences							
BTap_2A_BTZ-A-O1.1_K01 The student is able to choose the appropriate method and diagnostic technique depending on the type and purpose of the study.	BTap_2A_K01	P7S_KK P7S_KO P7S_KR		C-1	T-A-8 T-W-7 T-W-1	M-2	S-1

Outcomes	Grade	Evaluation criterion
Knowledge		
BT_2A_BTZ-A-O1.1_W01	*2,0*	
	3,0	The student has a minimum knowledge on basic techniques used in microbiology diagnostic laboratory.
	3,5	
	4,0	
	4,5	
	5,0	
Skills		
BTap_2A_BTA-A-O1.1_U01	*2,0*	
	3,0	The student can sufficiently utilize appropriate methods and techniques for the isolation and identification of microorganisms.
	3,5	
	4,0	
	4,5	
	5,0	
Other social competences		
BTap_2A_BTZ-A-O1.1_K01	*2,0*	
	3,0	The student is able to choose the appropriate method and diagnostic technique depending on the type and purpose of the study on a sufficient level.
	3,5	
	4,0	
	4,5	
	5,0	

Required reading

1. Yi-Wei Tang, Charles W. Stratton, Advanced Techniques in Diagnostic Microbiology, Springer, USA, 2006

2. Stephen H. Gillespie, Peter M. Hawkey, Principles and Practice of Clinical Bacteriology, Wiley, UK, 2006

Supplementary reading

1. C. L. Gyles, J. F. Prescott, J. G. Songer, C. O. Thoen, Pathogenesis of Bacterial Infections in Animals, Blackwell Publishing, 2010

Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Faculty of Biotechnology and Animal Husbandry

Field of study	Biotechnology		
Mode of study	stacjonarna	*Level*	drugi
Graduate's qualification	magister inżynier		
Fields of study	dziedzina nauk ścisłych i przyrodniczych, dziedzina nauk rolniczych, dziedzina nauk inżynieryjno-technicznych		
Academic disciplines	nauki biologiczne (5%), technologia żywności i żywienia (10%), rolnictwo i ogrodnictwo (10%), inżynieria chemiczna (5%), inżynieria materiałowa (10%), zootechnika i rybactwo (60%)		
Educational profile	ogólnoakademicki		
Module			
Course unit	**Veterinary microbiology**		
Code	BT_2A_S_20/21_BTA-A-O1.2		
Field of specialisation	Biotechnology in animal production and environmental protection		
Administering faculty	Katedra Immunologii, Mikrobiologii i Chemii Fizjologicznej		
ECTS	3,0	*ECTS (forms)*	3,0
Form of course credit	zaliczenie	*Language*	polski
Electives	4	*Elective group*	

Form of instruction	*Cod*	*Semester*	*Hours*	*ECTS*	*Weight*	*Credit*
ćwiczenia audytoryjne	A	2	15	1,5	0,41	zaliczenie
wykłady	W	2	15	1,5	0,59	zaliczenie

Leading teacher	Fijałkowski Karol (karol.fijalkowski@zut.edu.pl)
Other teachers	

Prerequisites

W-1	microbiology and immunology

Module/course unit objectives

C-1	The course aims are to provide a comprehensive theoretical and practical knowledge of veterinary microbiology and to provide students with the latest information in scientific microbiology.

Course content divided into various forms of instruction		*Number of hours*
T-A-1	Practical information about working in veterynary microbiological laboratory and preparing and storage of culture media;	2
T-A-2	Microscopic examination of microorganisms - procedures for preparing bacterial smears and stainings of direct preparation.	2
T-A-3	Detection and identification of various kind of animal pathogens.	2
T-A-4	Determination of antibiotic susceptibility of animal pathogenic bacteria.	2
T-A-5	Identification of virulence factors produced by animal pathogenic bacteria.	2
T-A-6	Molecular diagnostics of microorganisms – PCR based techniques.	2
T-A-7	Isolation and identification of microorganisms from clinical samples and determination of their quantity.	2
T-A-8	Isolations of pure bacteria from a mix culture.	1
T-W-1	Determination and controlling of bacterial growth.	3
T-W-2	Culturing of various microorganisms.	2
T-W-3	Biochemical activity of pathogenic bacteria.	2
T-W-4	Animal pathogens.	2
T-W-5	Resistance to antibiotics of animal pathogenic bacteria.	2
T-W-6	Vrulence factors produced by animal pathogens.	2
T-W-7	Diagnostic methods used for identyfication of animal pathogenic microorganisms.	2

Student workload - forms of activity		*Number of hours*
A-A-1	participation in the course	15
A-A-2	preparing for classes	15
A-A-3	independent study of theory necessary to carry out the classes	15
A-W-1	participation in the course	15
A-W-2	preparing to exams	15

Student workload - forms of activity		*Number of hours*
A-W-3	independent study of lectures	15

Teaching methods / tools	
M-1	Discussion
M-2	Lectures supported by multimedia presentations
M-3	Practical work

Evaluation methods (F - progressive, P - final)		
S-1	F	Control of proper operation during the laboratory classes.
S-2	F	Written test of lectures and exercises.
S-3	P	Preparation of the multimedia presentation.

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6, 7 lub 8 PRK	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6 lub 7 umożliwiających uzyskanie kompetencji inżynierskich	Course objectives	Course content	Teaching methods	Evaluation methods
Knowledge							
BTap_2A_BTA-A-O1.2_W02 The student knows microbial identification techniques used in microbiological diagnostic laboratory.	BTap_2A_W08	P7S_WG	P7S_WG	C-1	T-A-2 T-A-4 T-A-3 T-A-6	M-2	S-2
Skills							
BTap_2A_BTA-A-O1.2_U02 The student uses appropriate methods and techniques to identify microorganisms.	BTap_2A_U05	P7S_UK P7S_UO P7S_UU P7S_UW	P7S_UW	C-1	T-A-4 T-W-4 T-A-5 T-W-6 T-A-7 T-W-7	M-1 M-3	S-1 S-3
Social competences							
BTap_2A_BTA-A-O1.2_K02 The student is able to choose the appropriate method and diagnostic technique depending on the type and purpose of the study.	BTap_2A_K01	P7S_KK P7S_KO P7S_KR		C-1	T-A-2 T-A-6 T-A-3 T-A-7 T-A-4 T-A-8 T-A-5	M-1	S-1

Outcomes	Grade	Evaluation criterion
Knowledge		
BTap_2A_BTA-A-O1.2_W02	*2,0*	
	3,0	The student has a minimum knowledge on basic techniques used in microbiology diagnostic laboratory.
	3,5	
	4,0	
	4,5	
	5,0	
Skills		
BTap_2A_BTA-A-O1.2_U02	*2,0*	
	3,0	The student can sufficiently utilize appropriate methods and techniques for the isolation and identification of microorganisms.
	3,5	
	4,0	
	4,5	
	5,0	
Other social competences		
BTap_2A_BTA-A-O1.2_K02	*2,0*	
	3,0	The student is able to choose the appropriate method and diagnostic technique depending on the type and purpose of the study on a sufficient level.
	3,5	
	4,0	
	4,5	
	5,0	

Required reading
1. Wei-Shou Hu, Cell culture bioprocess engineering, University of Minnesota, USA, 2012
2. Yi-Wei Tang, Charles W. Stratton, Advanced Techniques in Diagnostic Microbiology, Springer, USA, 2006
3. Yi-Wei Tang, Charles W. Stratton, Advanced Techniques in Diagnostic Microbiology, Springer, USA, 2006
4. Stephen H. Gillespie, Peter M. Hawkey, Principles and Practice of Clinical Bacteriology, Wiley, UK, 2006
5. Stokłosowa S. (red.), Hodowla komórek i tkanek, PWN, Warszawa, 2004
6. Kayser O., Muller R. H. (red.), Biotechnologia Farmaceutyczna, PWN, Warszawa, 2003

Required reading
7. Libudzisz Z., Kowal K., Żakowska Z. (red.), Mikrobiologia techniczna, tom 1 i 2, PWN, Warszawa, 2008

Supplementary reading
1. Stephen P. Denyer (Editor), Norman A. Hodges (Editor), Sean P. Gorman (Editor), Brendan F. Gilmore (Editor), Hugo and Russell's Pharmaceutical Microbiology, Wiley-Blackwell, USA, 2011
2. C. L. Gyles, J. F. Prescott, J. G. Songer, C. O. Thoen, Pathogenesis of Bacterial Infections in Animals, Blackwell Publishing, 2010

Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Faculty of Biotechnology and Animal Husbandry

Field of study	Biotechnology		
Mode of study	stacjonarna	*Level*	drugi
Graduate's qualification	magister inżynier		
Fields of study	dziedzina nauk ścisłych i przyrodniczych, dziedzina nauk rolniczych, dziedzina nauk inżynieryjno-technicznych		
Academic disciplines	nauki biologiczne (5%), technologia żywności i żywienia (10%), rolnictwo i ogrodnictwo (10%), inżynieria chemiczna (5%), inżynieria materiałowa (10%), zootechnika i rybactwo (60%)		
Educational profile	ogólnoakademicki		
Module			
Course unit	**Molecular genetic methods in diagnostics**		
Code	BT_2A_S_20/21_BTA-A-O2.1		
Field of specialisation	Biotechnology in animal production and environmental protection		
Administering faculty	Katedra Genetyki i Ogólnej Hodowli Zwierząt		
ECTS	3,0	*ECTS (forms)*	3,0
Form of course credit	zaliczenie	*Language*	angielski
Electives	2	*Elective group*	

Form of instruction	*Cod*	*Semester*	*Hours*	*ECTS*	*Weight*	*Credit*
ćwiczenia audytoryjne	A	1	15	1,5	0,41	zaliczenie
wykłady	W	1	15	1,5	0,59	zaliczenie

Leading teacher	Terman Arkadiusz (Arkadiusz.Terman@zut.edu.pl)
Other teachers	

Prerequisites	
W-1	Knowledge of molecular genetics, cellular biology and microbiology.

Module/course unit objectives	
C-1	Presentation of basic cencept and modern techniques in molecular genetics in diagnostic.
C-2	Showing the possibility of using molecular diagnostic effects in other sciences.

Course content divided into various forms of instruction		*Number of hours*
T-A-1	Methods of arquiring genetic material for research.	4
T-A-2	Types of PCR techniques in molecular diagnostic.	4
T-A-3	Types of electrophoresis ans its use in diagnostic.	2
T-A-4	Techniki hybrydyzacyjne (hybrydyzacja punktowa, hybrydyzacja typu Southern, hybrydyzacja Northern) wykorzystywane w diagnostyce.	2
T-A-5	Use molecular genetic methods in medical diagnostic and environmental protection.	3
T-W-1	Types of molecular diagnostics.	2
T-W-2	Polymorphism evaluation methods	4
T-W-3	Microarrays in molecular diagnostic.	2
T-W-4	Molecular diagnostic strategies.	4
T-W-5	Use of molecular genetics in diagnostic.	3

Student workload - forms of activity		*Number of hours*
A-A-1	Participation in classes.	15
A-A-2	Consultation.	5
A-A-3	Preparation of presentation.	8
A-A-4	Passing the classes.	5
A-A-5	Omówienie zaliczenia ćwiczeń	2
A-A-6	Self study of literature.	10
A-W-1	Participation in lectures.	15
A-W-2	Preparation for passing.	10
A-W-3	Studing the leterature.	8
A-W-4	Consultations.	8

Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Faculty of Biotechnology and Animal Husbandry

Student workload - forms of activity		*Number of hours*
A-W-5	Written test.	4

Teaching methods / tools	
M-1	Information lecture.
M-2	Didactic discussion.

Evaluation methods (F - progressive, P - final)		
S-1	F	Evaluation of the presentation.

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6, 7 lub 8 PRK	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6 lub 7 umożliwiających uzyskanie kompetencji inżynierskich	Course objectives	Course content	Teaching methods	Evaluation methods
Knowledge							
BT_2A_BTZ-A-O2.1_W01 zna podstawowe techniki i metody genetyki molekularnej stosowane w diagnostyce oraz ma wiedzę na temat możliwości wykorzystania tych metod i technik w różnych dziedzinach nauki i życia	BTap_2A_W07	P7S_WG		C-1	T-A-1 T-W-2 T-A-2 T-W-3 T-W-1	M-1	S-1
Skills							
BT_2A_BTZ-A-O2.1_U01 Student objaśnia metody i techniki genetyki molekularnej stosowane w diagnostyce i charakteryzuje możliwości ich zastosowania w różnych dziedzinach życia i nauki	BTap_2A_U05	P7S_UK P7S_UO P7S_UU P7S_UW	P7S_UW	C-2	T-A-3 T-W-4 T-A-4 T-W-5 T-A-5	M-2	S-1
Social competences							
BT_2A_BTZ-A-O2.1_K01 Jest zdolny do dzielenia się wiedzą dotyczącą możliwości wykorzystania metod i technik genetyki molekularnej stosowanych w diagnostyce w różnych dziedzinach życia i nauki.	BTap_2A_K02	P7S_KK		C-2	T-A-5 T-W-5 T-W-4	M-2	S-1

Outcomes	Grade	Evaluation criterion
Knowledge		
BT_2A_BTZ-A-O2.1_W01	*2,0*	Student nie zna technik i metod genetyki molekularnej oraz nie ma wiedzy na temat możliwości wykorzystania tych technik i metod w różnych dziedzinach nauki i życia.
	3,0	Student ma wiedzę na temat technik i metod genetyki molekularnej oraz na temat możliwości wykorzystania tych technik i metod w różnych dziedzinach nauki i życia.
	3,5	Student dobrze zna podstawowe techniki i metody genetyki molekularnej oraz ma podstawową wiedzy na temat możliwości wykorzystania tych technik i metod w różnych dziedzinach nauki i życia.
	4,0	Student dobrze zna podstawowe i słabo zna najnowsze techniki i metody genetyki molekularnej oraz ma podstawową wiedzy na temat możliwości wykorzystania tych technik i metod w różnych dziedzinach nauki i życia.
	4,5	Student dobrze zna podstawowe i najnowsze techniki i metody genetyki molekularnej oraz ma ugruntowaną wiedzę na temat standardowych możliwościach wykorzystania tych technik i metod w różnych dziedzinach nauki i życia.
	5,0	Student doskonale zna podstawowe i najnowsze techniki i metody genetyki molekularnej oraz orientuje się w najnowszych i standardowych możliwościach wykorzystania tych technik i metod w różnych dziedzinach nauki i życia.
Skills		
BT_2A_BTZ-A-O2.1_U01	*2,0*	Student nie umie przedstawić założeń podstawowych metod i technik genetyki molekularnej oraz nie umie scharakteryzować warunków przebiegu różnych metod jak również nie umie przyporządkować aspektów aocjacyjnych dla podstawowowych technik i metod w różnych dziedzinach życia i wiedzy.
	3,0	Student umie przedstawić założenia podstawowych metod i technik genetyki molekularnej oraz charakteryzuje warunki przebiegu różnych metod jak również umie słabo przyporządkować aspekty asocjacyjne dla podstawowowych technik i metod w różnych dziedzinach życia i wiedzy.
	3,5	Student umie przedstawić ogólnie założenia podstawowych metod i technik genetyki molekularnej oraz charakteryzuje warunki przebiegu różnych metod jak również umie ogólnie przyporządkować aspekty asocjacyjne dla podstawowowych technik i metod w różnych dziedzinach życia i wiedzy.
	4,0	Student umie przedstawić założenia podstawowych (ogólnie) i najnowszych (słabo) metod i technik genetyki molekularnej oraz charakteryzuje warunki przebiegu różnych metod jak również umie przyporządkować aspekty asocjacyjne dla podstawowowych (ogólnie) i najnowszych (słabo) technik i metod w różnych dziedzinach życia i wiedzy.
	4,5	Student umie przedstawić założenia podstawowych (biegle) i najnowszych (ogólnie) metod i technik genetyki molekularnej oraz charakteryzuje warunki przebiegu różnych metod jak również umie przyporządkować aspekty asocjacyjne dla podstawowowych (biegle) i najnowszych (ogólnie) technik i metod w różnych dziedzinach życia i wiedzy.
	5,0	Student umie biegle przedstawić założenia podstawowych i najnowszych metod i technik genetyki molekularnej oraz biegle charakteryzuje warunki przebiegu różnych metod jak równieżumie przyporządkować aspekty asocjacyjne dla podstawowowych i najnowszych technik i metod w różnych dziedzinach życia i wiedzy.
Other social competences		

Other social competences		
BT_2A_BTZ-A-O2.1_K01	*2,0*	Student nie jest zdolny do zaprezentowania wiedzy na temat możliwości wykorzystania metod i technik genetyki molekularnej stosowanej w diagnostycew różnych dziedzinach życia i nauki.
	3,0	Student w sposób słabo komunikatywny i słabo zrozumiały dzieli się wiedzą na temat możliwości wykorzystania standardowych metod i technik genetyki molekularnej stosowanej w diagnostycew różnych dziedzinach życia i nauki.
	3,5	Student w sposób dość komunikatywny i dość zrozumiały dzieli się wiedzą na temat możliwości wykorzystania standardowych metod i technik genetyki molekularnej stosowanej w dignostycew różnych dziedzinach życia i nauki.
	4,0	Student w sposób komunikatywny i zrozumiały dzieli się wiedzą na temat możliwości wykorzystania standardowych metod i technik genetyki molekularnej stosowanej w diagnostycew różnych dziedzinach życia i nauki.
	4,5	Student w sposób komunikatywny i dość zrozumiały dzieli się wiedzą na temat możliwości wykorzystania standardowych i najnowszych metod i technik genetyki molekularnej stosowanej w diagnostyce w różnych dziedzinach życia i nauki.
	5,0	Student w sposób bardzo komunikatywny i zrozumiały dzieli się wiedzą na temat możliwości wykorzystania standardowych i najnowszych metod i technik genetyki molekularnej stosowanej w diagnostyce w różnych dziedzinach życia i nauki.

Required reading

1. T.A. Brown, Gene cloning and DNA analysis, Willey-Blackwell, 2016

Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Faculty of Biotechnology and Animal Husbandry

Field of study	Biotechnology		
Mode of study	stacjonarna	*Level*	drugi
Graduate's qualification	magister inżynier		
Fields of study	dziedzina nauk ścisłych i przyrodniczych, dziedzina nauk rolniczych, dziedzina nauk inżynieryjno-technicznych		
Academic disciplines	nauki biologiczne (5%), technologia żywności i żywienia (10%), rolnictwo i ogrodnictwo (10%), inżynieria chemiczna (5%), inżynieria materiałowa (10%), zootechnika i rybactwo (60%)		
Educational profile	ogólnoakademicki		
Module			
Course unit	**Genetic diagnostic of animals**		
Code	BT_2A_S_20/21_BTA-A-O2.2		
Field of specialisation	Biotechnology in animal production and environmental protection		
Administering faculty	Katedra Nauk o Zwierzętach Przeżuwających		
ECTS	3,0	*ECTS (forms)*	3,0
Form of course credit	zaliczenie	*Language*	angielski
Electives	2	*Elective group*	

Form of instruction	*Cod*	*Semester*	*Hours*	*ECTS*	*Weight*	*Credit*
ćwiczenia audytoryjne	A	1	15	1,5	0,41	zaliczenie
wykłady	W	1	15	1,5	0,59	zaliczenie

Leading teacher	Dybus Andrzej (Andrzej.Dybus@zut.edu.pl)
Other teachers	Dybus Andrzej (Andrzej.Dybus@zut.edu.pl), Jędrzejczak-Silicka Magdalena (mjedrzejczak@zut.edu.pl)

Prerequisites	
W-1	The knowledge of genetics, genetic engineering and molecular biology.

Module/course unit objectives	
C-1	Learning of student with diseases of animals.
C-2	Learning of student with genetic diagnostic of animals.

Course content divided into various forms of instruction		*Number of hours*
T-A-1	Molecular diagnostic of diseases in farm animals.	4
T-A-2	Genetic testing of production traits. Marker-assisted selection.	4
T-A-3	Genetic tests of sport performance in horses, pigeons and dogs.	2
T-A-4	Genetic resistance/susceptibility for prion diseases in sheep.	2
T-A-5	Avian DNA sexing test.	2
T-A-6	Aggression in dogs (VNTR polymorphism in DRD4 gene).	1
T-W-1	Genetic diagnostic of animals - introduction.	2
T-W-2	Genetic diseases of domestic animals. Resistance to diseases.	2
T-W-3	Prions diseases. Molecular basis, symptoms, genetic testing of farm animals.	4
T-W-4	Genetic diagnostic of production and functional traits of animals. Marker-assisted selection.	4
T-W-5	Parentage verification of animals.	2
T-W-6	Genetic diagnostic of sport performance (horses, dogs, racing pigeons).	1

Student workload - forms of activity		*Number of hours*
A-A-1	Taking classes.	15
A-A-2	Preparation for classes.	15
A-A-3	Preparation (in silico) of genetic test.	5
A-A-4	Preparation for the test.	10
A-W-1	Participation in lectures.	15
A-W-2	Studying of scientific references (papers).	15
A-W-3	Preparation for the tests.	15

Teaching methods / tools	
M-1	Lectures presenting theoretical issues.
M-2	Multimedia presentations.

Evaluation methods (F - progressive, P - final)		
S-1	P	Examination.
S-2	P	The project of genetic test. Theoretical test.

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6, 7 lub 8 PRK	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6 lub 7 umożliwiających uzyskanie kompetencji inżynierskich	Course objectives	Course content	Teaching methods	Evaluation methods
Knowledge							
BT_2A_BTZ-A-O2.2_W01 The student descripes the molecular stategy for genetic diagnostic of animals	BTap_2A_W06 BTap_2A_W08	P7S_WG	P7S_WG	C-2	T-A-5 T-W-3 T-W-1 T-W-4 T-W-2 T-W-5	M-1 M-2	S-1 S-2
BT_2A_BTZ-A-O2.2_W02 Specify of genetic diseases of animals, with description of their molecular basis.	BTap_2A_W07	P7S_WG		C-1	T-A-1 T-A-4 T-A-2 T-A-6 T-A-3 T-W-6	M-1 M-2	S-1 S-2
Skills							
BT_2A_BTZ-A-O2.2_U01 A student can utilise an appropriate DNA test in genetic diagnostic of animals.	BTap_2A_U05	P7S_UK P7S_UO P7S_UU P7S_UW	P7S_UW	C-1 C-2	T-A-1 T-W-1 T-A-2 T-W-2 T-A-3 T-W-3 T-A-4 T-W-4 T-A-5 T-W-5 T-A-6 T-W-6	M-1 M-2	S-2
Social competences							
BT_2A_BTZ-A-O2.2_K01 A student is creative in preparation of DNA tests for genetic diagnostic of animals.	BTap_2A_K02	P7S_KK		C-1 C-2	T-A-1 T-W-1 T-A-2 T-W-2 T-A-3 T-W-3 T-A-4 T-W-4 T-A-5 T-W-5 T-A-6 T-W-6	M-1 M-2	S-1 S-2

Outcomes	Grade	Evaluation criterion
Knowledge		
BT_2A_BTZ-A-O2.2_W01	*2,0*	
	3,0	A student knows different molecular strategies in genetic diagnostic of animals
	3,5	
	4,0	
	4,5	
	5,0	
BT_2A_BTZ-A-O2.2_W02	*2,0*	
	3,0	A student knows some genetic diseases of animals.
	3,5	
	4,0	
	4,5	
	5,0	
Skills		
BT_2A_BTZ-A-O2.2_U01	*2,0*	
	3,0	A student is able to utilise an appropriate DNA test.
	3,5	
	4,0	
	4,5	
	5,0	
Other social competences		
BT_2A_BTZ-A-O2.2_K01	*2,0*	
	3,0	A student is creative in preparation of DNA test
	3,5	
	4,0	
	4,5	
	5,0	

Required reading
1. Charon K.M., Świtoński M., Genetyka zwierząt, PWN, Warszawa, 2008
2. Słomski R. (red.), Analiza DNA – teoria i praktyka, Wydawnictwo UP, Poznań, 2008

Required reading
3. Kosowska B., Nowicki B., Genetyka weterynaryjna, PZWL, Warszawa, 1999

Supplementary reading
1. Brown T.A., Genomy, PWN, Warszawa, 2009

Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Faculty of Biotechnology and Animal Husbandry

Field of study	Biotechnology		
Mode of study	stacjonarna	*Level*	drugi
Graduate's qualification	magister inżynier		
Fields of study	dziedzina nauk ścisłych i przyrodniczych, dziedzina nauk rolniczych, dziedzina nauk inżynieryjno-technicznych		
Academic disciplines	nauki biologiczne (5%), technologia żywności i żywienia (10%), rolnictwo i ogrodnictwo (10%), inżynieria chemiczna (5%), inżynieria materiałowa (10%), zootechnika i rybactwo (60%)		
Educational profile	ogólnoakademicki		
Module			
Course unit	**Monitoring of transgenic crops**		
Code	BT_2A_S_20/21_BTA-A-O3.1		
Field of specialisation	Biotechnology in animal production and environmental protection		
Administering faculty	Katedra Genetyki, Hodowli i Biotechnologii Roślin		
ECTS	3,0	*ECTS (forms)*	3,0
Form of course credit	zaliczenie	*Language*	angielski
Electives	3	*Elective group*	

Form of instruction	*Cod*	*Semester*	*Hours*	*ECTS*	*Weight*	*Credit*
ćwiczenia audytoryjne	A	2	15	1,5	0,41	zaliczenie
wykłady	W	2	15	1,5	0,59	zaliczenie

Leading teacher	Smolik Miłosz (Milosz.Smolik@zut.edu.pl)
Other teachers	Krupa-Małkiewicz Marcelina (Marcelina.Krupa-Malkiewicz@zut.edu.pl)

Prerequisites	
W-1	Znajomość genetyki i hodowli roślin. Znajomość podstaw inżynierii genetycznej

Module/course unit objectives	
C-1	Celem realizowanych zajęć jest zapoznanie studentów z prawnymi oraz technicznymi możliwościami monitorowania upraw transgenicznych w świetle obowiązującego prawa i dostępnych metod badawczych
C-2	Celem realizowanych zajęć jest zwrócenie uwagi na potencjał, jakim są genetycznie zmodyfikowane odmiany roślin uprawnych w kontekście ich wykorzystania, jako donorów genów dla innych odmian roślin uprawnych otrzymywanych na drodze krzyżowań i selekcji

Course content divided into various forms of instruction		*Number of hours*
T-A-1	Characteristics of methods used for genetic transformation in plants. The use of tissue cultures to induce and obtain new types of variability. Reasonableness and examples.	4
T-A-2	Rules for identifying and identifying gene construct elements or target genes in crops and selected food products - demonstration activities.	8
T-A-3	Reference laboratories. GMO records. The biosecurity system in Poland.	3
T-W-1	Introduction to biotechnology. The importance of modern biotechnology. What is GMO? Objectives and methods obtaining of genetically modified organisms.	2
T-W-2	Genetically modified plants. Examples and directions of genetic modification.	2
T-W-3	Legal aspects of coexistence. Examples of legal regulations in selected EU countries. Nature and objectives of GMO monitoring.	2
T-W-4	Development, standardisation and examples of methods used to identify genetically modified organisms and products derived from them. Methodological aspects and legal regulations. Certified reference materials.	4
T-W-5	Legal regulations permitting the cultivation and sale of food products produced with or from GMOs.	3
T-W-6	Monitoring of transgenic crops on the example of legislation and practical applications of selected countries.	2

Student workload - forms of activity		*Number of hours*
A-A-1	Attendance at lectures.	15
A-A-2	Studying recommended literature.	17
A-A-3	Consultation.	11
A-A-4	Test.	2
A-W-1	Attendance at lectures.	15
A-W-2	Studying recommended literature.	10

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Student workload - forms of activity		*Number of hours*
A-W-3	Consultation.	11
A-W-4	Preparation for credit.	7
A-W-5	Test.	2

Teaching methods / tools	
M-1	Wykład informacyjny
M-2	Pokaz
M-3	Prezentacje studentów
M-4	Dyskusja dydaktyczna

Evaluation methods (F - progressive, P - final)		
S-1	F	Ocena prezentacji
S-2	P	Kolokwium zaliczeniowe

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6, 7 lub 8 PRK	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6 lub 7 umożliwiających uzyskanie kompetencji inżynierskich	Course objectives	Course content	Teaching methods	Evaluation methods
Knowledge							
BT_2A_BTZ-A-O3.1_W01 Wskazywanie zasadności ochrony zasobów genowych zwierząt. Charakterystyka gatunków zwierząt objętych programem ochrony zasobów genowych w Polsce i na świecie	BTap_2A_W12 BTap_2A_W14	P7S_WG		C-2	T-W-1 T-W-3 T-W-2	M-1	S-2
Skills							
BT_2A_BTZ-A-O3.1_U01 Umiejętność wskazywania negatywnych skutków zmniejszania bioróżnorodności	BTap_2A_U06	P7S_UW		C-2	T-A-1 T-W-5 T-A-2 T-W-6 T-W-4	M-1 M-4	S-2
Social competences							
BTap_2A_BTZ-A-O3.1_K01 Świadomość zmniejszania się bioróżnorodności i wyrażanie oceny dotyczącej ochrony zasobów genowych zwierząt	BTap_2A_K03	P7S_KK P7S_KO		C-2	T-A-1 T-A-3 T-A-2	M-1 M-3	S-2

Outcomes	Grade	Evaluation criterion
Knowledge		
BT_2A_BTZ-A-O3.1_W01	*2,0*	
	3,0	student w stopniu dostatecznym opanował wiedzę z zakresu ochrony zasobów genowych
	3,5	
	4,0	
	4,5	
	5,0	
Skills		
BT_2A_BTZ-A-O3.1_U01	*2,0*	
	3,0	w stopniu dostatecznym student potrafi wskazywać negatywne skutki zmniejszania się bioróżnorodności
	3,5	
	4,0	
	4,5	
	5,0	
Other social competences		
BTap_2A_BTZ-A-O3.1_K01	*2,0*	
	3,0	w stopniu dostatecznym student potrafi wykazać negatywne znaczenia zmniejszania się bioróżnorodności
	3,5	
	4,0	
	4,5	
	5,0	

Required reading

1. Red. Z. Litwińczuk, Ochrona zasobów genetycznych zwierząt gospodarskich i dziko żyjących, PWRiL, 2011
2. Freeland J. R., Ekologia molekularna, PWN, Warszawa, 2008

Supplementary reading

1. Hartl D. L., Clark A. G., Podstawy Genetyki Populacyjnej, Wydawnictwo Uniwersytetu Warszawskiego, Warszawa, 2009

Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Faculty of Biotechnology and Animal Husbandry

Field of study	Biotechnology		
Mode of study	stacjonarna	*Level*	drugi
Graduate's qualification	magister inżynier		
Fields of study	dziedzina nauk ścisłych i przyrodniczych, dziedzina nauk rolniczych, dziedzina nauk inżynieryjno-technicznych		
Academic disciplines	nauki biologiczne (5%), technologia żywności i żywienia (10%), rolnictwo i ogrodnictwo (10%), inżynieria chemiczna (5%), inżynieria materiałowa (10%), zootechnika i rybactwo (60%)		
Educational profile	ogólnoakademicki		
Module			
Course unit	**Risks resulting from the use of GMOs**		
Code	BT_2A_S_20/21_BTA-A-O3.2		
Field of specialisation	Biotechnology in animal production and environmental protection		
Administering faculty	Katedra Genetyki, Hodowli i Biotechnologii Roślin		
ECTS	3,0	*ECTS (forms)*	3,0
Form of course credit	zaliczenie	*Language*	angielski
Electives	3	*Elective group*	

Form of instruction	*Cod*	*Semester*	*Hours*	*ECTS*	*Weight*	*Credit*
ćwiczenia audytoryjne	A	2	15	1,5	0,41	zaliczenie
wykłady	W	2	15	1,5	0,59	zaliczenie

Leading teacher	Smolik Miłosz (Milosz.Smolik@zut.edu.pl)
Other teachers	Krupa-Małkiewicz Marcelina (Marcelina.Krupa-Malkiewicz@zut.edu.pl)

Prerequisites	
W-1	Znajomość genetyki, hodowli roślin, podstaw inżynierii genetycznej oraz podstaw biotechnologii roślin

Module/course unit objectives	
C-1	Celem zajęć jest zapoznanie studentów z zagrożeniami, jakie niesie ze sobą użytkowanie GMO w tym możliwości zanieczyszczenia środowiska (transfer genów)
C-2	Omówiony zostanie wpływ presji selekcyjnej na organizmy żywe i możliwość ich uodpornienia na pestycydy
C-3	Zapoznanie z etycznymi i prawnymi aspektami uwalniania organizmów modyfikowanych genetycznie do środowiska

Course content divided into various forms of instruction		*Number of hours*
T-A-1	Rules on the release of GMOs into the environment. Legislation in force and proposed in Poland and other countries.	4
T-A-2	Rules for identifying and identifying gene construct elements or target genes in crops and selected food products - demonstration activities.	8
T-A-3	Legal, economic and ecological consequences of coexistence. Legal solutions based on the example of selected EU countries.	3
T-W-1	Methods for plant risk assessment of GM products in the EU.	2
T-W-2	Potential risk to human health arising from the use of BT toxin and the glyphosate and glufosinate-resistance genes.	2
T-W-3	Risks arising from the use of GMOs and the possibility of environmental pollution through gene transfer.	2
T-W-4	Risks that may arise from the use of food produced from GMOs and from the addition of GMOs. Transgenic plant food products on the national and EU markets.	2
T-W-5	Legal, social and economic aspects in the light of the emergence of possible risks arising from the cultivation of GM crops.	2
T-W-6	Instytucje odpowiedzialne za bezpieczeństwo i certyfikację żywności GM. Institutions responsible for the safety and certification of GM food.	1
T-W-7	Identification of GMOs. Identification of gene constructs and selected elements of gene constructs using PCR technology. Other methods used to identify GMOs.	4

Student workload - forms of activity		*Number of hours*
A-A-1	Attendance at lectures.	15
A-A-2	Preparation of a multimedia presentation.	16
A-A-3	Self-sufficient repetition of the material.	8
A-A-4	Discussion of the results, passing the course.	6
A-W-1	Attendance at lectures.	15

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Student workload - forms of activity		*Number of hours*
A-W-2	Individual consultations.	5
A-W-3	Credit for the material and discussion of the results.	5
A-W-4	Self-sufficient repetition of the material.	15
A-W-5	Preparation for the discussion.	5

Teaching methods / tools	
M-1	Wykład informacyjny
M-2	Wykład problemowy
M-3	prezentacja multimedialna
M-4	dyskusja dydaktyczna

Evaluation methods (F - progressive, P - final)		
S-1	P	zaliczenie pisemne
S-2	F	ocena przygotowanej prezentacji
S-3	F	ocena aktywności podczas zajęć

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6, 7 lub 8 PRK	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6 lub 7 umożliwiających uzyskanie kompetencji inżynierskich	Course objectives	Course content	Teaching methods	Evaluation methods
Knowledge							
BTap_2A_BTZ-A-O3.2_W01 uzyskanie wiedzy na temat celów i metod tworzenia organizmów modyfikowanych genetycznie	BTap_2A_W02 BTap_2A_W07 BTap_2A_W14	P7S_WG P7S_WK	P7S_WK	C-1	T-A-1 T-W-2 T-W-1 T-W-3	M-3	S-1
Skills							
BT_2A_BTZ-A-O3.2_U01 Umie formułować i przedstawiać poparte wszechstronną wiedzą, samodzielne sądy na temat celowości skutków płynących z tworzenia i wykorzystania w praktyce GMO	BTap_2A_U04 BTap_2A_U08	P7S_UW	P7S_UW	C-2 C-3	T-A-1 T-W-2 T-A-2 T-W-3 T-A-3	M-2 M-3 M-4	S-2 S-3
Social competences							
BT_2A_BTZ-A-O3.2_K01 Ma świadomość wszechstronnych skutków tworzenia oraz wykorzystania GMO i wyraża swoje oceny na ten temat	BTap_2A_K02 BTap_2A_K03	P7S_KK P7S_KO		C-1 C-2	T-A-1 T-A-3 T-A-2 T-W-3	M-1 M-2 M-3 M-4	S-2 S-3

Outcomes	Grade	Evaluation criterion
Knowledge		
BTap_2A_BTZ-A-O3.2_W01	*2,0*	
	3,0	w stopniu dostatecznym student opanowal wiedzę na temat celów i metod tworzenia GMO
	3,5	
	4,0	
	4,5	
	5,0	
Skills		
BT_2A_BTZ-A-O3.2_U01	*2,0*	Student nie potrafi zidentyfikować i poradzić sobie samodzielnie z trudnościami mogącymi pojawić się na każdym z etapów tworzenia pracy, nie operuje wiedzą kontekstową
	3,0	Student nie potrafi zidentyfikować i poradzić sobie samodzielnie z trudnościami mogącymi pojawić się na każdym z etapów zleconego zadania, nie operuje wiedzą kontekstową
	3,5	Student potrafi zidentyfikować i poradzić sobie, z nieznaczną pomocą nauczyciela, z wybranymi trudnościami związanymi z procesem przygotowania zleconego zadania
	4,0	Student potrafi zidentyfikować i samodzielnie radzi sobie z podstawowymi trudnościami związanymi z procesem przygotowania zleconego zadania
	4,5	Student potrafi samodzielnie zidentyfikować i radzi sobie z podstawowymi trudnościami związanymi z procesem przygotowania własnego przedsięwzięcia
	5,0	Student samodzielnie identyfikuje i rozwiązuje trudności związane z procesem przygotowania własnego przedsięwzięcia
Other social competences		

Other social competences		
BT_2A_BTZ-A-O3.2_K01	*2,0*	student unika podejmowania działań, nie wykazuje inicjatywy, wykazuje postawę nieprzychylną wobec wszelkich poczynań prowadzącego
	3,0	student nie unika podejmowania działań, ale też nie podejmuje ich z własnej woli. Wykazuje postawę neutralną (obojętną) wobec poleceń prowadzącego.
	3,5	student nie unika podejmowania działań, ale też nie podejmuje ich z własnej woli. Adaptuje się jednak do sytuacji dydaktycznych zaaranżowanych przez nauczyciela. Wykazuje postawę umiarkowanie przychylną wobec poczynań prowadzącego
	4,0	student dostosowuje się do sytuacji dydaktycznej, w jakiej się znalazł. Podejmuje działania z własnej woli, ale nie angażuje się spontanicznie
	4,5	student nie tylko dostosowuje się do sytuacji dydaktycznej, w jakiej się znalazł, ale i organizuje ją wykazując przy tym przychylną postawę wobec poczynań prowadzącego
	5,0	student samorzutnie rozpoczyna działania, kierując się przy tym pozytywną postawą wobec poczynań prowadzącego

Required reading

1. Ministerstwo Środowiska, Organizmy modyfikowane genetycznie, http://gmo.ekoportal.pl/, Warszawa, 2012

2. P. Węgleński (red.), Genetyka molekularna, PWN, Warszawa, 2006, wydanie 6 zmienione

3. Gajewski W., Węgleński P, Inżynieria genetyczna, PWN, Warszawa, 2011, kilka wydań

4. Allison L. A., Podstawy biologii molekularnej, WUW, Warszawa, 2007

5. Jendrośka J. i Jerzmański J. (red.), Prawo ochrony środowiska dla praktyków, Verlag Dashofer, Warszawa, 2011, wydawnictwo ciągłe, aktualizowane kwartalnie

Supplementary reading

1. Newell John tłum. z ang. A. Bartoszek-Pączkowska, W roli stwórcy? Dokąd zmierza inżynieria genetyczna, WTN, Warsyawa, 1997

Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Faculty of Biotechnology and Animal Husbandry

Field of study	Biotechnology		
Mode of study	stacjonarna	*Level*	drugi
Graduate's qualification	magister inżynier		
Fields of study	dziedzina nauk ścisłych i przyrodniczych, dziedzina nauk rolniczych, dziedzina nauk inżynieryjno-technicznych		
Academic disciplines	nauki biologiczne (5%), technologia żywności i żywienia (10%), rolnictwo i ogrodnictwo (10%), inżynieria chemiczna (5%), inżynieria materiałowa (10%), zootechnika i rybactwo (60%)		
Educational profile	ogólnoakademicki		
Module			
Course unit	**Molecular breeding**		
Code	BT_2A_S_20/21_BTA-A-O4.1		
Field of specialisation	Biotechnology in animal production and environmental protection		
Administering faculty	Katedra Genetyki, Hodowli i Biotechnologii Roślin		
ECTS	3,0	*ECTS (forms)*	3,0
Form of course credit	zaliczenie	*Language*	angielski
Electives	1	*Elective group*	

Form of instruction	*Cod*	*Semester*	*Hours*	*ECTS*	*Weight*	*Credit*
ćwiczenia audytoryjne	A	1	15	1,5	0,41	zaliczenie
wykłady	W	1	15	1,5	0,59	zaliczenie

Leading teacher	Masojć Piotr (Piotr.Masojc@zut.edu.pl)
Other teachers	Milczarski Paweł (Pawel.Milczarski@zut.edu.pl), Myśków Beata (Beata.Myskow@zut.edu.pl), Smolik Miłosz (Milosz.Smolik@zut.edu.pl)

Prerequisites	
W-1	Basic knowledge in the field od genetics and molecular biology
W-2	Basic knowledge in the field of breeding

Module/course unit objectives	
C-1	The aim of this course is learning how to use molecular markers in breeding

Course content divided into various forms of instruction		*Number of hours*
T-A-1	Methods of generating PCR-based molecular markers	4
T-A-2	Methods of generating SNP markers through genotyping by sequencing (GBS)	4
T-A-3	Methods of identification and mapping of QTLs	4
T-A-4	Methods of marker validation	3
T-W-1	Methods of generating molecular markers	3
T-W-2	Functional markers- strategies of their development	2
T-W-3	Examples of markers useful in molecular breeding	2
T-W-4	Strategies of molecular breeding	2
T-W-5	Molecular markers for quantitative trait loci (QTL)	2
T-W-6	Molecular markers for identification of species and varieties used in breeding	2
T-W-7	Examples of implementation of molecular breeding in development of new varieties	2

Student workload - forms of activity		*Number of hours*
A-A-1	Attending classes	15
A-A-2	Preparation to classes	20
A-A-3	Preparation of presentation	10
A-W-1	Attending lectures	15
A-W-2	Self-study of the topics from lectures	15
A-W-3	Preparations to tests and exams	15

Teaching methods / tools	
M-1	Informing-type lectures

Evaluation methods (F - progressive, P - final)		
S-1	F	Presentations of students based on available publications
S-2	P	Test to check students knowledge at the end of lectures

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6, 7 lub 8 PRK	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6 lub 7 umożliwiających uzyskanie kompetencji inżynierskich	Course objectives	Course content	Teaching methods	Evaluation methods
Knowledge							
BT_2A_BTZ-A-O4.1_W01 Student possess knowledge about methods of applying molecular markers in selection and breedingi	BTap_2A_W06 BTap_2A_W08 BTap_2A_W13 BTap_2A_W15	P7S_WG	P7S_WG	C-1	T-A-1 T-W-3 T-A-2 T-W-4 T-W-1 T-W-5 T-W-2	M-1	S-1 S-2
Skills							
BT_2A_BTZ-A-O4.1_U01 Student can plan selection of useful genotypes applying molecular markers	BTap_2A_U05 BTap_2A_U06 BTap_2A_U08	P7S_UK P7S_UO P7S_UU P7S_UW	P7S_UW	C-1	T-A-1 T-W-3 T-A-2 T-W-4 T-W-1 T-W-5 T-W-2	M-1	S-1 S-2
Social competences							
BTap_2A_BTZ-A-O4.1_K01 Student is aware of possibilities and obstacles of methods of molecular breeding in breeding practice	BTap_2A_K02	P7S_KK		C-1	T-W-2	M-1	S-1 S-2

Outcomes	Grade	Evaluation criterion
Knowledge		
BT_2A_BTZ-A-O4.1_W01	*2,0*	Brak orientacji o źródłach pochodzenia i ewolucji zwierząt domowych. Nie potrafi omówic zjawisk związanych ze zdolnościami adaptacyjnymi zwierząt do narzuconych przez człowieka warunków niewoli oraz nie rozumie behawioralnych przyczyn terytorializmu wykluczających mozliwosc udomowienia. Nie potrafi zdefiniowac genezy i etapów udomowienia, wskazac historycznych miejsc występowania współczesnie zyjących przodków, nie rozumie pojęcia politopii i monotopii, nie wskazuje cech fizjologicznych, morfologicznych i behawioralnych wynikających z udomowienia.
	3,0	Ma orientację o źródłach pochodzenia i ewolucji zwierząt domowych. Omówia zjawiska związane ze zdolnościami adaptacyjnymi zwierząt do narzuconych przez człowieka warunków niewoli oraz rozumie behawioralne przyczyny terytorializmu wykluczające mozliwosc udomowienia. Definiuje genezę i wskazuje etapy udomowienia, historyczne miejsca występowania współczesnie żyjących przodków, rozumie pojęcia politopii i monotopii, wskazuje cechy fizjologiczne, morfologiczne i behawioralne wynikające z udomowienia.
	3,5	
	4,0	
	4,5	
	5,0	
Skills		
BT_2A_BTZ-A-O4.1_U01	*2,0*	Brak orientacji o źródłach pochodzenia i ewolucji zwierząt domowych. Nie potrafi omówic zjawisk związanych ze zdolnościami adaptacyjnymi zwierząt do narzuconych przez człowieka warunków niewoli oraz nie rozumie behawioralnych przyczyn terytorializmu wykluczających mozliwosc udomowienia. Nie potrafi zdefiniowac genezy i etapów udomowienia, wskazac historycznych miejsc występowania współczesnie zyjących przodków, nie rozumie pojęcia politopii i monotopii, nie wskazuje cech fizjologicznych, morfologicznych i behawioralnych wynikających z udomowienia.
	3,0	Ma orientację o źródłach pochodzenia i ewolucji zwierząt domowych. Omówia zjawiska związane ze zdolnościami adaptacyjnymi zwierząt do narzuconych przez człowieka warunków niewoli oraz rozumie behawioralne przyczyny terytorializmu wykluczające mozliwośc udomowienia. Definiuje genezę i wskazuje etapy udomowienia, historyczne miejsca występowania współczesnie żyjących przodków, rozumie pojęcia politopii i monotopii, wskazuje cechy fizjologiczne, morfologiczne i behawioralne wynikające z udomowienia.
	3,5	
	4,0	
	4,5	
	5,0	
Other social competences		
BTap_2A_BTZ-A-O4.1_K01	*2,0*	
	3,0	
	3,5	
	4,0	
	4,5	
	5,0	

Required reading

1. Weising K., Nybom H., Wolff K, Kahl G, DNA fingerprinting in plants. Principles, Methods and Applications, CRC Press, Taylor & Francis Group, Boca Raton, USA, 2005

Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Faculty of Biotechnology and Animal Husbandry

Field of study	Biotechnology		
Mode of study	stacjonarna	*Level*	drugi
Graduate's qualification	magister inżynier		
Fields of study	dziedzina nauk ścisłych i przyrodniczych, dziedzina nauk rolniczych, dziedzina nauk inżynieryjno-technicznych		
Academic disciplines	nauki biologiczne (5%), technologia żywności i żywienia (10%), rolnictwo i ogrodnictwo (10%), inżynieria chemiczna (5%), inżynieria materiałowa (10%), zootechnika i rybactwo (60%)		
Educational profile	ogólnoakademicki		
Module			
Course unit	**Methods of monitoring the reproductive processes in animal**		
Code	BT_2A_S_20/21_BTA-A-O4.2		
Field of specialisation	Biotechnology in animal production and environmental protection		
Administering faculty	Katedra Biotechnologii Rozrodu Zwierząt i Higieny Środowiska		
ECTS	3,0	*ECTS (forms)*	3,0
Form of course credit	zaliczenie	*Language*	angielski
Electives	1	*Elective group*	

Form of instruction	*Cod*	*Semester*	*Hours*	*ECTS*	*Weight*	*Credit*
ćwiczenia audytoryjne	A	1	15	1,5	0,41	zaliczenie
wykłady	W	1	15	1,5	0,59	zaliczenie

Leading teacher	Stankiewicz Tomasz (Tomasz.Stankiewicz@zut.edu.pl)
Other teachers	Gączarzewicz Dariusz (dariusz.gaczarzewicz@zut.edu.pl), Stankiewicz Tomasz (Tomasz.Stankiewicz@zut.edu.pl), Udała Jan (Jan.Udala@zut.edu.pl)

Prerequisites

W-1	The knowledge of the biotechnology in animal reproduction.

Module/course unit objectives

C-1	Acquainting students with the possibility of controlling the reproductive processes in male and female taking the performance of detection of various ailments and disorders.
C-2	Developing skills of the proper selection of methods and interpretation of the results in the evaluation of the reproductive processes.

Course content divided into various forms of instruction		*Number of hours*
T-A-1	The indirect methods for monitoring of ovarian cycle (signs of oestrus, hormonal tests, evaluation of cervical mucus and its degree of crystallization, cytological smear evaluation, measurement of body temperature).	4
T-A-2	The direct methods for monitoring of ovarian cycle (laparoscopy, ultrasound).	3
T-A-3	Methods for detection and monitoring of course of the pregnancy.	3
T-A-4	The monitoring of seasonal reproductive processes.	2
T-A-5	Macroscopic evaluation of ovarian cysts and abnormalities of the reproductive organs.	3
T-W-1	The monitoring of the ovarian cycle.	4
T-W-2	The diagnostic methods used in dysfunction of the ovary (ovarian cysts, ovarian tumors).	4
T-W-3	The hormonal basis for the detection of pregnancy. Achievements in the field of the imaging course of the pregnancy.	4
T-W-4	The contemporary andrological diagnostic.	3

Student workload - forms of activity		*Number of hours*
A-A-1	The participation in the classes.	15
A-A-2	Preparation of the presentation.	18
A-A-3	Preparing to pass the exercise.	12
A-W-1	The participation in the classes.	15
A-W-2	The study of professional literature.	10
A-W-3	The participation in the consultations.	5
A-W-4	Preparing to pass lectures.	15

Teaching methods / tools	
M-1	The informative lecture with the use multimedia techniques.

Evaluation methods (F - progressive, P - final)		
S-1	P	The final test covering the range of content lectures.
S-2	P	The final test covering the range of exercise program content.

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6, 7 lub 8 PRK	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6 lub 7 umożliwiających uzyskanie kompetencji inżynierskich	Course objectives	Course content	Teaching methods	Evaluation methods
Knowledge							
BT_2A_BTZ-A-O4.2_W01 The student knows the methods for monitoring the ovarian cycle, taking into account the various phases of this cycle and its potential disorders. He knows the basics of hormonal methods for the detection of pregnancy.	BTap_2A_W15	P7S_WG		C-1 C-2	T-W-1 T-W-3 T-W-2	M-1	S-1 S-2
BT_2A_BTZ-A-O4.2_W02 The student knows the current methods of used in the andrological diagnosis.	BTap_2A_W06 BTap_2A_W15	P7S_WG		C-1 C-2	T-W-4	M-1	S-1
Skills							
BT_2A_BTZ-A-O4.2_U01 The student should be able to apply an appropriate method for monitoring the ovarian cycle and pregnancy. He is able to interpret indicator parameters of disorders in the reproduction.	BTap_2A_U06	P7S_UW		C-2	T-A-1 T-W-1 T-A-2 T-W-2 T-A-3 T-W-3 T-A-5	M-1	S-1 S-2
BT_2A_BTZ-A-O4.2_U02 The student is able to interpret of parameters of the clinical evaluation in the male reproduction.	BTap_2A_U06	P7S_UW		C-1 C-2	T-W-4	M-1	S-1
Social competences							
BT_2A_BTZ-A-O4.2_K01 The student will be able to apply the acquired knowledge and skills for the proper selection of and interpretation of the results in the evaluation of the reproductive processes. The completion of the course will be helpfull for the future work in the veterinary and medical laboratories.	BTap_2A_K02	P7S_KK		C-2	T-W-1 T-W-3 T-W-2 T-W-4	M-1	S-1 S-2

Outcomes	Grade	Evaluation criterion
Knowledge		
BT_2A_BTZ-A-O4.2_W01	*2,0*	
	3,0	The student lists the methods for monitoring the ovarian cycle and pregnancy diagnosis, but he can not describe them.
	3,5	
	4,0	
	4,5	
	5,0	
BT_2A_BTZ-A-O4.2_W02	*2,0*	
	3,0	The student lists the methods used in the evaluation of the semen.
	3,5	
	4,0	
	4,5	
	5,0	
Skills		
BT_2A_BTZ-A-O4.2_U01	*2,0*	
	3,0	The student can choose some methods for monitoring the ovarian cycle and pregnancy diagnosis.
	3,5	
	4,0	
	4,5	
	5,0	
BT_2A_BTZ-A-O4.2_U02	*2,0*	
	3,0	The student is able interpret only some parameters in the clinical evaluation of the male reproduction.
	3,5	
	4,0	
	4,5	
	5,0	

Other social competences		
BT_2A_BTZ-A-O4.2_K01	*2,0*	
	3,0	The student is oriented in the discussed topics, but he showed little independent activity in the discussion. He can work in a group.
	3,5	
	4,0	
	4,5	
	5,0	

Required reading

1. Hafez E.S.E., Hafez B., Reproduction in farm animals, Lippincott Williams & Wilkins, Philadelphia (U.A), 2000

2. T. A. McGeady, P. J. Quinn, E. S. FitzPatrick, M. T. Ryan, Veterinary Embryology, Blackwell Publishing, 2006

Supplementary reading

1. Gordon I. R., Reproductive technologies in farm animals, CABI Pub, Wallingford, Oxfordshire, Cambridge, MA, 2004

Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Faculty of Biotechnology and Animal Husbandry

Field of study	Biotechnology		
Mode of study	stacjonarna	*Level*	drugi
Graduate's qualification	magister inżynier		
Fields of study	dziedzina nauk ścisłych i przyrodniczych, dziedzina nauk rolniczych, dziedzina nauk inżynieryjno-technicznych		
Academic disciplines	nauki biologiczne (5%), technologia żywności i żywienia (10%), rolnictwo i ogrodnictwo (10%), inżynieria chemiczna (5%), inżynieria materiałowa (10%), zootechnika i rybactwo (60%)		
Educational profile	ogólnoakademicki		
Module			
Course unit	**Molecular basic of evolution**		
Code	BT_2A_S_20/21_BTA-A-O5.1		
Field of specialisation	Biotechnology in animal production and environmental protection		
Administering faculty	Katedra Genetyki, Hodowli i Biotechnologii Roślin		
ECTS	3,0	*ECTS (forms)*	3,0
Form of course credit	zaliczenie	*Language*	angielski
Electives	5	*Elective group*	

Form of instruction	*Cod*	*Semester*	*Hours*	*ECTS*	*Weight*	*Credit*
ćwiczenia audytoryjne	A	2	15	1,5	0,41	zaliczenie
wykłady	W	2	15	1,5	0,59	zaliczenie

Leading teacher	Masojć Piotr (Piotr.Masojc@zut.edu.pl)
Other teachers	Masojć Piotr (Piotr.Masojc@zut.edu.pl), Myśków Beata (Beata.Myskow@zut.edu.pl)

Prerequisites

W-1	Basic knowledge about genetics and molecular biology

Module/course unit objectives

C-1	Students are tought about machanisms of evolution on molecular level and methhods of searching evolutionary process

Course content divided into various forms of instruction		*Number of hours*
T-A-1	Methods of constructing phylogenetic trees	6
T-A-2	methods of estimating genetic similarity and genetic distance	4
T-A-3	Evolution of selected organisms based on molecular data	5
T-W-1	Theories on pre-biotic evolution	1
T-W-2	Concept of "molecular clock"	2
T-W-3	Molecular mechanisms underlying changes at the genome level	2
T-W-4	Mechanisms underlying evolution at the gene level	2
T-W-5	Examples of protein evolution	2
T-W-6	Exons and introns in evolution	2
T-W-7	Evolution changes conserved in the DNA sequences	2
T-W-8	Mitochondrial DNA in tracking human evolution	1
T-W-9	Chromosome Y DNA in tracking human evolution	1

Student workload - forms of activity		*Number of hours*
A-A-1	Attending classes	15
A-A-2	Preparation to classes	15
A-A-3	Literature reading	5
A-A-4	Preparation to tests and exams	10
A-W-1	Learning during lectures	15
A-W-2	self-studying of topics presented on lectures	10
A-W-3	Reading literature	10
A-W-4	Preparing to tests and exams	10

Teaching methods / tools

Teaching methods / tools	
M-1	Informing-type lecture
M-2	Presentation
M-3	Film
M-4	working in groups
M-5	Discussion

Evaluation methods (F - progressive, P - final)		
S-1	F	Evaluation of presentation
S-2	P	Final evaluation of knowledge and activities

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6, 7 lub 8 PRK	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6 lub 7 umożliwiających uzyskanie kompetencji inżynierskich	Course objectives	Course content	Teaching methods	Evaluation methods
Knowledge							
BT_2A_BTZ-A-O5.1_W01 student knows molecula mechanisms of evolution. Can define meaning of descriptions related to molecular evolution	BTap_2A_W01 BTap_2A_W07	P7S_WG		C-1	T-A-1 T-W-3 T-A-2 T-W-4 T-A-3 T-W-5 T-W-1 T-W-6 T-W-2 T-W-7	M-1 M-2 M-3 M-4 M-5	S-1 S-2
Skills							
BTap_2A_BTA-A-O5.1_U01 Student can construct phylogenetic trees using computer programs and data bases							
Social competences							
BT_2A_BTZ-A-O5.1_K01 Student is active in students group or act as a leader in conducting projects	BTap_2A_K01	P7S_KK P7S_KO P7S_KR		C-1	T-A-1 T-W-4 T-A-2 T-W-5 T-A-3 T-W-6 T-W-2 T-W-7 T-W-3	M-1 M-2 M-3 M-4 M-5	S-1 S-2

Outcomes	Grade	Evaluation criterion
Knowledge		
BT_2A_BTZ-A-O5.1_W01	*2,0*	Niedostateczna wiedza z zakresu genetyki ogólnej. Student nie potrafi omówić mitozy i cyklu komórkowego w aspekcie cytogenetycznym. Student nie zna podstawowych kariotypów zwierząt gospodarskich.
	3,0	Dostateczna wiedza z zakresu prowadzonego przedmiotu z dużymi niedociągnięciami.
	3,5	Dostateczna wiedza z zakresu przedmiotu prowadzonego. Student potrafi omówić mitozę oraz cykl komórkowy ale nie rozumie jej znaczenia. Umie podać przykłady aberracji chromosomowych ale nie potrafi opisać ich skutków. Student zna podstawowe kariotypy zwierząt gospodarskich.
	4,0	Dobre opanowanie wiedzy z zakresu przedmiotu prowadzonego. Student umie podać przykłady aberracji chromosomowych oraz potrafi opisać ich skutki. Student w stopniu dobrym umie omówić kariotypy zwierząt gospodarskich.
	4,5	Dobre opanowanie wiedzy z zakresu przedmiotu prowadzonego. Student umie podać przykłady aberracji chromosomowych oraz potrafi opisać ich skutki. Student w stopniu dobrym umie omówić kariotypy zwierząt gospodarskich i domowych. Zna metody barwienia chromosomów.
	5,0	Bardzo dobre opanowanie wiedzy z zakresu przedmiotu prowadzonego. Student bardzo dobrze charakteryzuje kariotypy zwierząt gospodarskich i domowych. Zna i potrafi opisać metody barwienia chromosomów.
Skills		
BTap_2A_BTA-A-O5.1_U01	*2,0*	
	3,0	
	3,5	
	4,0	
	4,5	
	5,0	
Other social competences		
BT_2A_BTZ-A-O5.1_K01	*2,0*	Student nie przejawia aktywności w grupie jako członek
	3,0	Student przejawia aktywności w grupie jako członek
	3,5	Student przejawia aktywności w grupie jako członek
	4,0	Student przejawia aktywności w grupie jako członek i podejmuje aktywność jako lider
	4,5	Student przejawia aktywności w grupie jako lider
	5,0	Student przejawia aktywności w grupie jako lider i jest aktywny

Required reading

1. Douglas J. Futuyma, Evolution, Sinauer Associates, Inc., Sunderland, USA, 2005, 1.

Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Faculty of Biotechnology and Animal Husbandry

Field of study	Biotechnology		
Mode of study	stacjonarna	*Level*	drugi
Graduate's qualification	magister inżynier		
Fields of study	dziedzina nauk ścisłych i przyrodniczych, dziedzina nauk rolniczych, dziedzina nauk inżynieryjno-technicznych		
Academic disciplines	nauki biologiczne (5%), technologia żywności i żywienia (10%), rolnictwo i ogrodnictwo (10%), inżynieria chemiczna (5%), inżynieria materiałowa (10%), zootechnika i rybactwo (60%)		
Educational profile	ogólnoakademicki		
Module			
Course unit	**Molecular modelling of enzymes**		
Code	BT_2A_S_20/21_BTA-A-O5.2		
Field of specialisation	Biotechnology in animal production and environmental protection		
Administering faculty	Katedra Immunologii, Mikrobiologii i Chemii Fizjologicznej		
ECTS	3,0	*ECTS (forms)*	3,0
Form of course credit	zaliczenie	*Language*	angielski
Electives	5	*Elective group*	

Form of instruction	*Cod*	*Semester*	*Hours*	*ECTS*	*Weight*	*Credit*
ćwiczenia audytoryjne	A	2	15	1,5	0,41	zaliczenie
wykłady	W	2	15	1,5	0,59	zaliczenie

Leading teacher	Drozd Radosław (Radoslaw.Drozd@zut.edu.pl)
Other teachers	

Prerequisites	
W-1	The elementary knowledge of genetics, molecular genetics, cell biology and evolution.
W-2	The intermadiate levele of knowledge of organic and inorganic chemistry, biochemistry, biophysics, English at intermediate level

Module/course unit objectives	
C-1	Developing skills of selection of appropriate bioinformatics tools to solve and analyze the structure of proteins
C-2	Mastering the ability to combine and correct interpretation of information relating to various levels of organization of protein structures

Course content divided into various forms of instruction		*Number of hours*
T-A-1	The introduction to proteins molecular structure part II	2
T-A-2	The introduction to proteins molecular structure part II	2
T-A-3	The in silico methods of proteins structure II and III level determination	2
T-A-4	The in silico methods of oligomeric enzymes structure determination	2
T-A-5	The methods for the effective ligands design for the enzymes activity modulation part I	2
T-A-6	The methods for the effective ligands design for the enzymes activity modulation part II	2
T-A-7	The Molecular Dynamic simulation methods as tools for testing in-silico changed structure of enzymes. part I	2
T-A-8	The Molecular Dynamic simulation methods as tools for testing in-silico changed structure of enzymes. part II	1
T-W-1	Methods for the data mining for protein structure on their I level. Prediction of catalytic and structural properties enzymes. part I	2
T-W-2	Methods for the data mining for protein structure on their I level. Prediction of catalytic and structural properties enzymes. part II	2
T-W-3	Methods for prediction localisation of enzymes catalytic sites	2
T-W-4	Methods for characterisaation catalytic sites properities.	2
T-W-5	Modeling of the catalytic properities of enzymes - pH optima	2
T-W-6	Molecular docking as tool for design a accurate enzymes inhibitors. Part I	2
T-W-7	Molecular docking as tool for design a accurate enzymes inhibitors. Part II	2
T-W-8	Methods of enzyme analysis results visualisation by using molecular modeling software	1

Student workload - forms of activity		*Number of hours*
A-A-1	Participation in the classes.	15

Student workload - forms of activity		*Number of hours*
A-A-2	Individual study of training materials	7
A-A-3	Preparation for passing the tutorial content.	7
A-A-4	consultations	16
A-W-1	Participation in lectures.	15
A-W-2	Independent study of lecture materials and recommended literature.	10
A-W-3	Consultation	5
A-W-4	Preparation for passing the lecture content.	8
A-W-5	Passing the lecture content.	5
A-W-6	Discussing lecture content	2

Teaching methods / tools	
M-1	Information lectures
M-2	explanation or clarification
M-3	description

Evaluation methods (F - progressive, P - final)		
S-1	P	test
S-2	F	multimedia presentation

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6, 7 lub 8 PRK	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6 lub 7 umożliwiających uzyskanie kompetencji inżynierskich	Course objectives	Course content	Teaching methods	Evaluation methods
Knowledge							
BT_2A_BTZ-A-O5.2_W03 Student has knowledge about the organization and structural relationships of proteins. He knows bioinformatic methods and tools for the analysis of protein structures. Has knowledge about the possibilities and consequences of manipulation in protein structures.	BTap_2A_W01	P7S_WG		C-1 C-2	T-A-1 T-A-4 T-A-3 T-A-5	M-1 M-2 M-3	S-2
Skills							
BT_2A_BTZ-A-O5.2_U01 Correctly applying a bioinformatic tools to 3D enzymes structure solving	BTap_2A_U05	P7S_UK P7S_UO P7S_UU P7S_UW	P7S_UW	C-1 C-2	T-W-1 T-W-3 T-W-2 T-W-4	M-3	S-2
Social competences							
BT_2A_BTZ-A-O5.2_K02 Understands the consequences of modifying protein structures on the functioning of living organisms	BTap_2A_K02	P7S_KK		C-1 C-2	T-A-1 T-A-4 T-A-3 T-A-5	M-1 M-2 M-3	S-2

Outcomes	Grade	Evaluation criterion
Knowledge		
BT_2A_BTZ-A-O5.2_W03	*2,0*	
	3,0	Preparation of a multimedia presentation, participation in 90% of auditory classes, Correct answer to 60% of test questions - exam
	3,5	
	4,0	
	4,5	
	5,0	
Skills		
BT_2A_BTZ-A-O5.2_U01	*2,0*	
	3,0	Preparation of a multimedia presentation, participation in 90% of auditory classes,
	3,5	
	4,0	
	4,5	
	5,0	
Other social competences		
BT_2A_BTZ-A-O5.2_K02	*2,0*	
	3,0	Preparation of a multimedia presentation, participation in 90% of auditory classes,
	3,5	
	4,0	
	4,5	
	5,0	

Required reading
1. K. I. Ramachandran, Gopakumar Deepa, Krishnan Namboori, Computational Chemistry and Molecular Modeling: Principles and Applications, Springer, Berlin Heidelberg, 2008
2. Paul G. Higgs, Teresa K. Attwood, Bioinformatics and Molecular Evolution, Wiley-Blackwell, USA, 2005, I
3. Huzefa Rangwala, George Karypis (Ed.), Introduction to Protein Structure Prediction: Methods and Algorithms, Wiley, USA, 2011, I
4. Andrzej Koliński red., Multiscale Approaches to Protein Modeling, Springer, 2010, I

Supplementary reading
1. Alan Cooper, Biophysical Chemistry, RSC, 2010, II

Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Faculty of Biotechnology and Animal Husbandry

Field of study	Biotechnology		
Mode of study	stacjonarna	*Level*	drugi
Graduate's qualification	magister inżynier		
Fields of study	dziedzina nauk ścisłych i przyrodniczych, dziedzina nauk rolniczych, dziedzina nauk inżynieryjno-technicznych		
Academic disciplines	nauki biologiczne (5%), technologia żywności i żywienia (10%), rolnictwo i ogrodnictwo (10%), inżynieria chemiczna (5%), inżynieria materiałowa (10%), zootechnika i rybactwo (60%)		
Educational profile	ogólnoakademicki		
Module			
Course unit	**In vitro and in vivo methods in toxicological assessment of xenobiotics**		
Code	BT_2A_S_20/21_BTA-A-O6.1		
Field of specialisation	Biotechnology in animal production and environmental protection		
Administering faculty	Katedra Biotechnologii Rozrodu Zwierząt i Higieny Środowiska		
ECTS	3,0	*ECTS (forms)*	3,0
Form of course credit	zaliczenie	*Language*	angielski
Electives	6	*Elective group*	

Form of instruction	*Cod*	*Semester*	*Hours*	*ECTS*	*Weight*	*Credit*
ćwiczenia audytoryjne	A	2	15	1,5	0,41	zaliczenie
wykłady	W	2	15	1,5	0,59	zaliczenie

Leading teacher	Tomza-Marciniak Agnieszka (Agnieszka.Tomza-Marciniak@zut.edu.pl)
Other teachers	Pilarczyk Bogumiła (Bogumila.Pilarczyk@zut.edu.pl)

Prerequisites

W-1	no requirements

Module/course unit objectives

C-1	To acquaint students with the in vivo and in vitro methods used in assessing the toxicity of xenobiotics.
C-2	To acquaint students with the mechanisms of action of toxic substances and their metabolism.
C-3	To acquaint students with the computational methods in toxicity, exposure and risk assessment.

Course content divided into various forms of instruction		*Number of hours*
T-A-1	Metabolism of xenobiotics.	2
T-A-2	The mechanisms of toxicity.	2
T-A-3	Methods for determining the median lethal dose/concentration (LD50 i LC50).	3
T-A-4	Calculation methods in the toxicity assessment. Exposure and risk assessment. Determination of NOAEL, LOAEL, LoAL and RfD.	3
T-A-5	Toxicological evaluation of raw materials and cosmetic products.	2
T-A-6	Alternative methods in ecotoxicological studies.	3
T-W-1	The use of animals in toxicometric research. The main organizations promoting alternative methods in the world. Database of in vitro techniques used in toxicology.	2
T-W-2	Use of in vivo tests in evaluation of the toxicity of chemicals. Types and directions of toxicological research.	2
T-W-3	Acute toxicity - classic and alternative methods.	4
T-W-4	Repeated dose toxicity. The methods used in assessing the genotoxicity, carcinogenicity, neurotoxicity, effects on reproduction, fertility and offspring.	3
T-W-5	Evaluation of toxicity of a compound based on the relationship between the chemical structure and biological activity (structure-activity relationship). Factors affecting the toxicity. Genetic factors increasing the sensitivity to chemical compounds.	2
T-W-6	Chemical safety. The most important rules governing the issue of chemical safety. The classification and labeling of chemicals.	2

Student workload - forms of activity		*Number of hours*
A-A-1	participation in lectures	15
A-A-2	studying indicated literature	15
A-A-3	preparation for test	15

Student workload - forms of activity		*Number of hours*
A-W-1	participation in lectures	15
A-W-2	studying indicated literature	15
A-W-3	preparation for test	15

Teaching methods / tools	
M-1	Delivery method, lecture/presentation.
M-2	Discussion
M-3	Explanation

Evaluation methods (F - progressive, P - final)		
S-1	F	test
S-2	F	assessment of student's activity and attitudes towards discussed issues.
S-3	F	report

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6, 7 lub 8 PRK	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6 lub 7 umożliwiających uzyskanie kompetencji inżynierskich	Course objectives	Course content	Teaching methods	Evaluation methods
Knowledge							
BT_2A_BTZ-A-O6.1_W01 Student describes methods using in toxicity assessment of xenobiotics.	BTap_2A_W01	P7S_WG		C-1	T-A-6 T-W-3 T-W-1 T-W-4 T-W-2 T-W-5	M-1 M-2 M-3	S-1
BT_2A_BTZ-A-O6.1_W02 Student desribes the metabolism of toxins and mechanisms of toxicity	BTap_2A_W01	P7S_WG		C-1	T-A-1 T-A-5 T-A-2	M-1 M-2 M-3	S-1
Skills							
BT_2A_BTZ-A-O6.1_U01 Student uses the computational methods in toxicity, exposure and risk assessment.	BTap_2A_U09	P7S_UW	P7S_UW	C-3	T-A-3 T-A-4	M-3	S-3
Social competences							
BT_2A_BTZ-A-O6.1_K01 Student understands the need to reduce the use of animals in toxicological studies.	BTap_2A_K06	P7S_KR		C-1	T-A-1 T-W-1 T-A-2 T-W-2 T-A-3 T-W-3 T-A-4 T-W-4 T-A-5 T-W-5 T-A-6 T-W-6	M-1 M-3	S-2

Outcomes	Grade	Evaluation criterion
Knowledge		
BT_2A_BTZ-A-O6.1_W01	*2,0*	
	3,0	The student lists and discribes the methods uses in toxicity assessment.
	3,5	
	4,0	
	4,5	
	5,0	
BT_2A_BTZ-A-O6.1_W02	*2,0*	
	3,0	Student describes phases of xenobiotic's metabolism and lists mechanisms of toxicity.
	3,5	
	4,0	
	4,5	
	5,0	
Skills		
BT_2A_BTZ-A-O6.1_U01	*2,0*	
	3,0	Student is able to calculate: the LD50 for a specific subtance (with using at least two methods), RfD, LOAL.
	3,5	
	4,0	
	4,5	
	5,0	

Other social competences		
BT_2A_BTZ-A-O6.1_K01	*2,0*	
	3,0	Student explains the reasons for reducing the number of animals in experimental studies.
	3,5	
	4,0	
	4,5	
	5,0	

Required reading
1. Seńczuk (ed.), Toksykologia współczesna, PWN, Warszawa, 2006
2. https://www.oecd-ilibrary.org/environment/oecd-guidelines-for-the-testing-of-chemicals-section-4-health-effects_20745788, 2011

Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Faculty of Biotechnology and Animal Husbandry

Field of study	Biotechnology		
Mode of study	stacjonarna	*Level*	drugi
Graduate's qualification	magister inżynier		
Fields of study	dziedzina nauk ścisłych i przyrodniczych, dziedzina nauk rolniczych, dziedzina nauk inżynieryjno-technicznych		
Academic disciplines	nauki biologiczne (5%), technologia żywności i żywienia (10%), rolnictwo i ogrodnictwo (10%), inżynieria chemiczna (5%), inżynieria materiałowa (10%), zootechnika i rybactwo (60%)		
Educational profile	ogólnoakademicki		
Module			
Course unit	**In silico analysis of nucleotide sequence**		
Code	BT_2A_S_20/21_BTA-A-O6.2		
Field of specialisation	Biotechnology in animal production and environmental protection		
Administering faculty	Katedra Nauk o Zwierzętach Przeżuwających		
ECTS	3,0	*ECTS (forms)*	3,0
Form of course credit	zaliczenie	*Language*	angielski
Electives	6	*Elective group*	

Form of instruction	*Cod*	*Semester*	*Hours*	*ECTS*	*Weight*	*Credit*
ćwiczenia audytoryjne	A	2	15	1,5	0,41	zaliczenie
wykłady	W	2	15	1,5	0,59	zaliczenie

Leading teacher	Dybus Andrzej (Andrzej.Dybus@zut.edu.pl)
Other teachers	

Prerequisites

W-1	The basic knowledge of computer science, genetics and molecular biology.

Module/course unit objectives

C-1	Learning of students with different types of nucleotide sequences in genomes.
C-2	The use of different bioinformatics programs for analysis of nucleotide sequences.

Course content divided into various forms of instruction		*Number of hours*
T-A-1	Gene prediction programs in eukaryota.	4
T-A-2	Bacterial Promoters and Operons.	2
T-A-3	Promoters/functional motifs.	2
T-A-4	RNA structures analyses.	2
T-A-5	Gene Finding in Viral Genomes	2
T-A-6	Alignments sequences and genomes	3
T-W-1	Gene Finding. Gene models construction, splice sites, protein-coding exons, promoters.	4
T-W-2	Bacterial Promoter, Operon and Gene Finding.	2
T-W-3	RNA classes.	2
T-W-4	Viral Genomes.	2
T-W-5	Sequence alignments.	3
T-W-6	RNA-Seq in transcriptomics.	2

Student workload - forms of activity		*Number of hours*
A-A-1	Taking classes.	15
A-A-2	Preparation for classes.	15
A-A-3	Creating of genetic test (in silico)	10
A-A-4	Preparation for the test.	5
A-W-1	Participation in lectures.	15
A-W-2	Study of scientific references.	15
A-W-3	Preparation for the test.	15

Teaching methods / tools

Teaching methods / tools	
M-1	Lectures presenting theoretical issues (multimedia ppt).
M-2	Practical classes using PC (online tools).

Evaluation methods (F - progressive, P - final)		
S-1	P	Examination.
S-2	F	Practical test including classes.

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6, 7 lub 8 PRK	Odniesienie do efektów uczenia się dla kwalifikacji na poziomie 6 lub 7 umożliwiających uzyskanie kompetencji inżynierskich	Course objectives	Course content	Teaching methods	Evaluation methods
Knowledge							
BT_2A_BTZ-A-O6.2_W01 A student describes selected nucleotide sequences in genomes and characterizes different bioinformatics programs for analyses.	BTap_2A_W07	P7S_WG		C-1	T-A-1 T-W-1 T-A-2 T-W-2 T-A-3 T-W-3 T-A-4 T-W-4 T-A-5 T-W-5 T-A-6 T-W-6	M-1 M-2	S-1 S-2
Skills							
BT_2A_BTZ-A-O6.2_U01 A student can use different online tools for nuleotide sequences analyses.	BTap_2A_U06	P7S_UW		C-1	T-A-1 T-A-4 T-A-2 T-A-5 T-A-3 T-A-6	M-2	S-2
Social competences							
BT_2A_BTZ-A-O6.2_K01 A student is aware of genetic variability in genomes. A student is able to work with different online programs for analyses of genomic variablity.	BTap_2A_K02	P7S_KK		C-1	T-A-1 T-W-1 T-A-2 T-W-2 T-A-3 T-W-3 T-A-4 T-W-4 T-A-5 T-W-5 T-A-6 T-W-6	M-1 M-2	S-2

Outcomes	Grade	Evaluation criterion
Knowledge		
BT_2A_BTZ-A-O6.2_W01	*2,0*	
	3,0	A student defines the types of nucleotide sequences in genomes and knows proper bioinformatic tools for analyses.
	3,5	
	4,0	
	4,5	
	5,0	
Skills		
BT_2A_BTZ-A-O6.2_U01	*2,0*	
	3,0	A student uses a proper bioinformatic tools for nucleotide sequences analyses
	3,5	
	4,0	
	4,5	
	5,0	
Other social competences		
BT_2A_BTZ-A-O6.2_K01	*2,0*	
	3,0	A student is able to work with online tools for analyses of genomic variablility.
	3,5	
	4,0	
	4,5	
	5,0	

Required reading

1. Terence A Brown., Genomes, 2nd edition, Oxford: Wiley-Liss; 2002., https://www.ncbi.nlm.nih.gov/books/NBK21128/, 2002, ISBN-10: 0-471-25046-5, Wolny dostęp internetowy

2. http://www.softberry.com, 2018, http://www.softberry.com

3. Koonin EV, Galperin MY., Sequence - Evolution - Function: Computational Approaches in Comparative Genomics., Boston: Kluwer Academic; 2003., https://www.ncbi.nlm.nih.gov/books/NBK20260/, 2003