



Field of study	Aquaculture and Fisheries					
Mode of study	stationary	Level	first cycle			
Graduate's qualification	inżynier					
Fields of science	agricultural sciences					
Disciplines of science	animal science and fisheries (100%)					
Educational profile	general academic					
Module						
Course unit	Biochemistry					
Code	WNOZIR/AQF/S1/					
Field of specialisation						
Administering faculty	Centrum Bioimmobilizacji i Innowacyjnych Materiałów Opakowaniowych					
ECTS	4.0	ECTS (forms)	4.0			
Form of course credit	examination	Language	english			
Electives			Elective group			
Form of instruction	Cod	Semester	Hours	ECTS	Weight	Credit
laboratory course	L	2	30	2.0	0.50	credits
lecture	W	2	30	2.0	0.50	examination
Leading teacher	Bartkowiak Artur (Artur-Bartkowiak@zut.edu.pl)					
Other teachers	Mizielińska Małgorzata (Malgorzata.Mizielinska@zut.edu.pl)					

Prerequisites

W-1	knowledge in the field of inorganic chemistry, organic chemistry, biology, chemistry, and mathematics at the level resulting from graduating from high school is necessary. In particular, knowledge of organic chemistry at the academic level (after first year) will be helpful, including the ability to use chemical formulas, the ability to write chemical reactions and ability to calculate.
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Module/course unit objectives

C-1	Providing students with basic knowledge in the field of biochemistry. This goal will be implemented by discussing the chemical composition and basic metabolic processes occurring in living cells, with particular emphasis on energy, regulation and integration of cell metabolism. Students will also be introduced to the basic experimental methods used in biochemistry.
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Course content divided into various forms of instruction**Number of hours**

T-L-1	Introduction: Organization of work in a biochemical laboratory. Required theoretical basis of chemical waste treatment. Required theoretical basis of experiments and results elaborating, formulating conclusions. Definitions of the molar and percentage concentrations and calculation of dilutions of the solutions. Conversion between percentage concentration and molar concentration. Preparation of the solutions of given molarities. Dilutions.	2
T-L-2	Monosaccharides and polysaccharides. Characteristic reactions (e.g. reducing sugars), Hydrolysis of glycosidic bond.	2
T-L-3	Lipids. Characteristic reactions of saturated and unsaturated fats.	2
T-L-4	Lipids. Determination of the properties of chosen fat (determination of the acidity of the substance and calculation of the acid value). Calculation of a saponification value.	2
T-L-5	Salivary amylase. Depolymerization of starch using amylase.	2
T-L-6	Written test I	2
T-L-7	Vitamins. Detection of the selected vitamins. Oxidation of vitamin C	2
T-L-8	Amino Acids and Peptides. Characteristic reactions.	2
T-L-9	Isoelectric point. Determination of isoelectric point of chosen selected protein	2
T-L-10	Lipase. Determination of enzyme activity using a titration method.	2
T-L-11	Trypsin. Determination of the rate of gelatin digestion by trypsin.	2
T-L-12	Onion DNA isolation. DNA hydrolysis.	2
T-L-13	RNA isolation from yeast. Characteristic reactions.	2
T-L-14	Invertase. The effect of inhibitors and physical factors on enzymatic reactions.	2
T-L-15	Written test II	2
T-W-1	An introduction to amino acids and proteins. Structure and properties of amino acids and proteins. Function of proteins	2
T-W-2	Enzymes. The structure and mode of action of selected enzymes. An introduction to kinetics of enzymatic reactions	2



Course content divided into various forms of instruction		Number of hours
T-W-3	Biological membranes and transport	2
T-W-4	Muscle structure. Biochemistry of contraction. Protein folding	2
T-W-5	Bioenergetics and metabolism. Principles of bioenergetics	3
T-W-6	Glycolysis and the catabolism of hexoses. The citric acid cycle.	3
T-W-7	Fatty acids metabolism. Amino acids oxidation and production of urea.	3
T-W-8	Oxidative phosphorylation and photophosphorylation.	3
T-W-9	Lipid biosynthesis. Carbohydrate biosynthesis	3
T-W-10	Biosynthesis of amino acids, nucleotides and related molecules.	3
T-W-11	DNA metabolism, RNA metabolism, protein metabolism.	2
T-W-12	Integration and hormonal regulation of mammalian metabolism	2

Student workload - forms of activity		Number of hours
A-L-1	Participation in laboratory classes, performing experiments	30
A-L-2	Preparing reports on experiments	10
A-L-3	Calculations of saponification values, acid values, pH. Calculation of percentage and molar concentration of the solution. Conversion between percentage concentration and molar concentration	10
A-L-4	learning required theoretical basics (for tests)	10
A-W-1	Participation in lectures	30
A-W-2	learning of theoretical basis for exam	30

Teaching methods / tools	
M-1	conveying the information through the lecture
M-2	performing experiments with students, preparing reports of experiments (containing results with observations, calculations and conclusions)
M-3	engaging the students to give verbal feedback (discussion)

Evaluation methods (F - progressive, P - final)		
S-1	F	attendance control
S-2	F	continuous assessment
S-3	F	written tests
S-4	F	experiment reports
S-5	P	written examination

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Reference to Learning Outcomes for qualifications at PQF 6, 7 or 8	Reference to learning outcomes for qualifications at level 6 or 7 that enable acquiring engineering competences	Course objectives	Course content	Teaching methods	Evaluation methods
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Knowledge							
AQF_1A_B09_W01 Student has knowledge of : 1) the structure and properties of amino acids and proteins and their function; 2) the structure and mode of action of selected enzymes.	AQF_1A_W01	P6S_WG	P6S_WG	C-1	T-W-1 T-W-2	M-1	S-5
AQF_1A_B09_W02 Student has knowledge of : 1) Bioenergetics and metabolism: Glycolysis and the catabolism of hexoses, the citric acid cycle; 2) Fatty acids metabolism; 3) Oxidative phosphorylation and photophosphorylation; 4) Lipid biosynthesis. Carbohydrate biosynthesis; 5) Biosynthesis of amino acids, nucleotides and related molecules; 6) DNA metabolism, RNA metabolism, protein metabolism.	AQF_1A_W01	P6S_WG	P6S_WG	C-1	T-W-3 T-W-8 T-W-4 T-W-9 T-W-5 T-W-10 T-W-6 T-W-11 T-W-7 T-W-12	M-1	S-5

Skills							
AQF_1A_B09_U01 Student is able to choose the right methods and carry out experiments. Student is able to identify and carry out characteristic reactions of: 1) saccharides and polysaccharides; 2) saturated and unsaturated fats; 3) vitamins; 4) proteins; 5) selected enzymes (including reaction kinetics); 6) DNA and RNA	AQF_1A_U02 AQF_1A_U05	P6S_UK P6S_UO P6S_UU P6S_UW		C-1	T-L-1 T-L-9 T-L-2 T-L-10 T-L-3 T-L-11 T-L-4 T-L-12 T-L-5 T-L-13 T-L-6 T-L-14 T-L-7 T-L-15 T-L-8	M-2 M-3	S-1 S-2 S-3 S-4
AQF_1A_B09_U02 Student can independently draw conclusions from the experiments and write the report	AQF_1A_U01 AQF_1A_U08	P6S_UW	P6S_UW	C-1	T-L-1 T-L-9 T-L-2 T-L-10 T-L-3 T-L-11 T-L-4 T-L-12 T-L-5 T-L-13 T-L-6 T-L-14 T-L-7 T-L-15 T-L-8	M-2 M-3	S-1 S-2 S-3 S-4

Social competences							
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AQF_1A_B09_K01 Student is aware of the importance of behavior in a professional manner, compliance with the principles of ethics. Student is aware of the responsibility for own work and team work	AQF_1A_K01 AQF_1A_K02 AQF_1A_K03	P6S_KK P6S_KO P6S_KR		C-1	T-L-1 T-L-2 T-L-3 T-L-4 T-L-5 T-L-6 T-L-7	T-L-8 T-L-9 T-L-10 T-L-11 T-L-12 T-L-13 T-L-14	M-2 M-3	S-1 S-2
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Outcomes	Grade	Evaluation criterion
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Knowledge

AQF_1A_B09_W01	2,0	
	3,0	Student has knowledge of topics conveyed through the lecture
	3,5	
	4,0	
	4,5	
	5,0	

AQF_1A_B09_W02	2,0	
	3,0	Student has knowledge of topics conveyed through the lecture
	3,5	
	4,0	
	4,5	
	5,0	

Skills

AQF_1A_B09_U01	2,0	
	3,0	Student is able to identify and carry out characteristic reactions of: 1) saccharides and polysaccharides; 2) saturated and unsaturated fats; 3) vitamins; 4) proteins; 5) selected enzymes (including reaction kinetics); 6) DNA and RNA. Student is able to carry out experiments
	3,5	
	4,0	
	4,5	
	5,0	

AQF_1A_B09_U02	2,0	
	3,0	Student is able to identify and carry out characteristic reactions of: 1) saccharides and polysaccharides; 2) saturated and unsaturated fats; 3) vitamins; 4) proteins; 5) selected enzymes (including reaction kinetics); 6) DNA and RNA. Student is able to carry out experiments
	3,5	
	4,0	
	4,5	
	5,0	

Other social competences

AQF_1A_B09_K01	2,0	
	3,0	Student is aware of the importance of behavior in a professional manner, compliance with the principles of ethics. Student is aware of the responsibility for own work and team work
	3,5	
	4,0	
	4,5	
	5,0	

Required reading

1. Lehninger A.L., Nelson D.L., Cox A.M., Principles of Biochemistry, Worth Publishers, New York, 1993, II
2. Donald Voet, Judith G. Voet, Biochemistry, John Wiley & Sons, 2010, 4
3. Denise R. Ferrier, Biochemistry, Wolters Kluwer, 2017

Supplementary reading

1. Prof. Edward Bańkowski, B I O C H E M I S T R Y W O R K B O O K, Medical University of Białystok, Białystok, 2013