



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	Nutrition and feed production					
Code	WNOZIR/AQF/S1/					
Field of specialisation						
Administering faculty	Department of Aquatic Bioengineering and Aquaculture					
ECTS	6.0	ECTS (forms)	6.0			
Form of course credit	examination	Language	english			
Electives			Elective group			
Form of instruction	Cod	Semester	Hours	ECTS	Weight	Credit
laboratory course	L	6	30	3.0	0.50	credits
lecture	W	6	30	3.0	0.50	examination
Leading teacher	Sadowski Jacek (Jacek.Sadowski@zut.edu.pl)					
Other teachers	Biernaczyk Marcin (Marcin.Biernaczyk@zut.edu.pl)					

WNoZiR



Prerequisites	
W-1	Basic knowledge gained by the student in the field of: aquaculture, biochemistry and physiology and biology of fish and crustaceans.

Module/course unit objectives	
C-1	To acquaint students with selected issues regarding the principles of nutrition and nutritional needs of hydrobionts.
C-2	Acquisition by students of the ability to perform basic analyzes of the chemical composition of feed and fish tissues and the use of basic methods and calculation methods to determine the efficiency of farming. Developing skills in interpreting rearing results and correctly formulating conclusions.
C-3	Practical familiarization of students with the types of feed components and industrial feeds available on the feed market, and production technologies.
C-4	Practical presentation of the functioning of the plant for fish feed - site visit and participation in the production cycle.

Course content divided into various forms of instruction		Number of hours
T-L-1	Discussion of the rules of behavior in the laboratory. Sampling rules for feed and fish tissue for analysis. Principles of performing analyzes along with the method of calculating the results. measurement errors.	2
T-L-2	Basic chemical analysis of feed and fish body. Determination of humidity and ash content in feed and tissue samples of fish.	4
T-L-3	Basic chemical analysis of feed and fish body. Determination of total protein content in samples of feed and fish tissues.	4
T-L-4	Basic chemical analysis of feed and fish body. Determination of crude fat content in samples of feed and fish tissues.	4
T-L-5	Calculation of breeding and nutrition indicators (task).	4
T-L-6	Component feed composition balancing	2
T-L-7	Recognition of raw materials for feed production organoleptic and qualitative assessment.	2
T-L-8	Review of feed for aquatic organisms.	2
T-L-9	Assessment of feed stability and their granulometry.	2
T-L-10	Fish feed production technology - presentation of a fish feed factory (field exercises).	4
T-W-1	Basic knowledge on the physiology of fish and shellfish digestion. Nutritional requirements of various ecological groups of fish (predators, herbivores, bentophages) and crustaceans.	2
T-W-2	Bioenergetics - basic terminology. Energy balance of food consumed. Energy requirements of fish and crustaceans.	2
T-W-3	Protein and amino acids - characteristics and importance in fish and shellfish nutrition.	2
T-W-4	Lipids and essential fatty acids (EFAs) - characteristics and role in fish and shellfish nutrition.	2
T-W-5	Carbohydrates - characteristics and importance in fish and shellfish nutrition.	2
T-W-6	Characteristics and importance of vitamins and micro- and macroelements in fish and crustacean nutrition.	2



Course content divided into various forms of instruction		Number of hours
T-W-7	Basic principles of feeding fish and crustaceans. Feeding fish larvae. Impact of nutrition on the growth rate and chemical composition of the fish body.	2
T-W-8	Vegetable feed components: role, chemical composition, market availability.	2
T-W-9	Feed components of animal origin (animal meal, fish meal) - characteristics, meaning, chemical composition, methods of production.	2
T-W-10	Non-energetic components and feed additives (dyes, binders, attractants).	2
T-W-11	Anti-nutritional substances in feed.	2
T-W-12	Technology for the production of granulated feed, flaking and other production methods for textured compound feed.	2
T-W-13	Production technology of extruded fish feed.	2
T-W-14	Rules for preparing feed recipes. Linear programming.	2
T-W-15	Legal regulations in the feed industry.	2

Student workload - forms of activity		Number of hours
A-L-1	Participation in classes.	45
A-L-2	Preparation for laboratory classes and tests.	30
A-L-3	Processing the results from the laboratory.	6
A-L-4	Reading the indicated literature and preparing a presentation.	6
A-L-5	Preparing the project.	3
A-W-1	Participation in classes	30
A-W-2	Preparation for the exam.	30
A-W-3	Own work with literature	30

Teaching methods / tools	
M-1	Information lecture
M-2	Didactic discussion related to the lecture
M-3	A show combined with an experience
M-4	Computer programmed methods
M-5	Laboratory exercises: chemical and physical analyzes
M-6	Production exercises
M-7	Project method

Evaluation methods (F - progressive, P - final)		
S-1	F	Correct calculation of the design task with the correct interpretation of the results. Correct (within the error limits) performance of chemical determinations of the body composition of fish and feed.
S-2	P	During the laboratory classes, knowledge is checked twice. The average of the obtained grades is the assessment summarizing the student's work in the laboratory.
S-3	P	The exam is conducted in writing and consists of three questions chosen randomly by the student. The final grade is the average of the three grades obtained for each question. Each of the partial answers must be given a positive grade.
S-4	P	Social competences are not assessed

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
Knowledge							
AQF_1A_C21_W01 The student has knowledge of the nutritional requirements and principles of feeding fish (larvae, fry, adults) and crustaceans.	AQF_1A_W07	P6S_WG		C-1	T-L-5 T-W-4 T-W-1 T-W-5 T-W-2 T-W-6 T-W-3 T-W-7	M-1 M-2	S-2 S-3
AQF_1A_C21_W02 as knowledge of nutrients, their metabolism and the physiological role in the body.	AQF_1A_W07	P6S_WG		C-1	T-L-1 T-W-4 T-W-2 T-W-5 T-W-3 T-W-6	M-1 M-2	S-2 S-3
AQF_1A_C21_W03 Has knowledge of the types and properties of feed components, their importance and the technology of producing fish and shellfish feed.	AQF_1A_W07	P6S_WG		C-3	T-L-6 T-W-10 T-L-7 T-W-11 T-L-8 T-W-12 T-L-9 T-W-13 T-L-10 T-W-14 T-W-8 T-W-15 T-W-9	M-3 M-6	S-2 S-3
Skills							



AQF_1A_C21_U01 The student performs basic chemical analyzes of fodder and fish body. He is able to calculate the values of basic breeding indicators and on their basis to formulate conclusions regarding the effects of nutrition. In addition, he should be able to properly balance feed in terms of both chemical composition and energy demand of hydrobionts.	AQF_1A_U20	P6S_UW		C-2	T-L-1 T-L-2 T-L-3 T-L-4 T-L-5	T-L-6 T-L-7 T-L-9 T-W-14	M-4 M-5 M-7	S-1
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Social competences

AQF_1A_C21_K01 Recognizes and understands the importance of ethical and social aspects related to the nutrition of hydrobionts.	AQF_1A_K02	P6S_KO P6S_KR		C-2	T-W-1		M-2	S-4
AQF_1A_C21_K02 Is aware of the impact of human activities in the field of fish and shellfish nutrition on the condition of the aquatic environment, cultured organisms and the dietary value of the product obtained.	AQF_1A_K04	P6S_KK		C-2	T-W-1 T-W-2 T-W-3 T-W-4	T-W-5 T-W-6 T-W-7	M-2	S-4

Outcomes	Grade	Evaluation criterion
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Knowledge

AQF_1A_C21_W01	2,0	
	3,0	The student has a basic knowledge of the nutritional requirements and general principles of fish and shellfish nutrition.
	3,5	
	4,0	
	4,5	
	5,0	
AQF_1A_C21_W02	2,0	
	3,0	The student has a basic knowledge of nutrients, can characterize their metabolism and the physiological role in the body in a limited way.
	3,5	
	4,0	
	4,5	
	5,0	
AQF_1A_C21_W03	2,0	
	3,0	Has a basic knowledge of the types and properties of feed components and their importance. He can discuss selected technologies of producing food for fish and crustaceans.
	3,5	
	4,0	
	4,5	
	5,0	

Skills

AQF_1A_C21_U01	2,0	
	3,0	Student performs basic chemical analyzes of feed and fish body. Can calculate the values of basic breeding indicators and on their basis to formulate very simple conclusions about the effects of nutrition. He is able to properly balance simple feeds in terms of both chemical composition and energy demand of hydrobionts.
	3,5	
	4,0	
	4,5	
	5,0	

Other social competences

AQF_1A_C21_K01	2,0	
	3,0	Recognizes the importance of the ethical and social aspects of fish and shellfish nutrition.
	3,5	
	4,0	
	4,5	
	5,0	
AQF_1A_C21_K02	2,0	
	3,0	Has sufficient but limited awareness of the impact of human activities in the field of fish and crustacean nutrition on the condition of the aquatic environment, reared organisms and the dietary value of the product obtained.
	3,5	
	4,0	
	4,5	
	5,0	

Required reading

1. De Silva S.S., Anderson T.A., Fish Nutrition in Aquaculture, Chapman and Hall, London, 1995
2. Guillaume J., Kaushik S., Bergot P., Metailler R., Nutrition and Feeding of Fish and Crustaceans, Springer, Praxis Publishing, Chichester, UK, 2001

Supplementary reading



Supplementary reading

1. Developments in Aquaculture and Fisheries Science, Elsevier, Amsterdam

2. Aquaculture nutrition, Wiley-Blackwell, <http://onlinelibrary.wiley.com/>