



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	<b>Genetics and fish selection</b>					
Code	WNOZIR/AQF/S1/					
Field of specialisation						
Administering faculty	Department of Meat Technology					
ECTS	5.0	ECTS (forms)	5.0			
Form of course credit	examination	Language	english			
Electives			Elective group			
Form of instruction	Cod	Semester	Hours	ECTS	Weight	Credit
laboratory course	L	4	30	2.0	0.50	credits
lecture	W	4	30	3.0	0.50	examination
Leading teacher	Panicz Remigiusz (rpanicz@zut.edu.pl)					
Other teachers						

WNoŻiR



Prerequisites	
W-1	Class in genetics and biology is recommended
W-2	Student should have a basic knowledge learned through fisheries and genetics subjects during studies
Module/course unit objectives	
C-1	The program focuses on broadening student's knowledge and understanding of the current technologies and processes in the genetic fish selection. Students in the programme will gain theoretical and practical competence within the broad field of fish genetics e.g. assessing of genetic variation, measuring changes of artificial selection in the hatchery, performing ploidy manipulation, genetic engineering and biological data processing.

Course content divided into various forms of instruction		Number of hours
T-L-1	Smplng and DNA extraction	4
T-L-2	Qualitative and quantitative assessment of DNA extracts	4
T-L-3	Amplification of selected genome regions	4
T-L-4	Sequencing techniques and raw data processing	2
T-L-5	Sequence alignments and marker identification	2
T-L-6	Estimation of allele frequencies	2
T-L-7	Microsatellite markers and association studies	2
T-L-8	Assesment of genetic variation based on single nucleotide polymorphisms (SNPs)	2
T-L-9	Phylogenetic analyses	2
T-L-10	Determination of ploidy level in fishes	4
T-L-11	Genomics in aquaculture studies	2
T-W-1	Basics of fish selection	2
T-W-2	Former and current selection strategies	2
T-W-3	Genetics and selective breeding in aquaculture and fisheries	2
T-W-4	Relationship between genotype and phenotype	2
T-W-5	Biochemical and molecular markers	4
T-W-6	Application of molecular markers for population genetic analysis	2
T-W-7	The concept of genetic variation	2
T-W-8	Measuring genetics variation in aquaculture	2
T-W-9	Applicability of quantitative trait loci (QTL)	2
T-W-10	Marker-assisted selection (MAS) programs in aquaculture production	2
T-W-11	Polyploidy, gynogenesis and androgenesis	2



Course content divided into various forms of instruction		Number of hours
T-W-12	Basics and development of breeding programme	2
T-W-13	Conservation of genetics resources (gen banking)	2
T-W-14	Measuring and maintaining of genetic pools	2

Student workload - forms of activity		Number of hours
A-L-1	Class participation	30
A-L-2	Self study	15
A-L-3	Preparation for evaluation	15
A-W-1	Class participation	30
A-W-2	Self study	30
A-W-3	Preparation for assessment	30

Teaching methods / tools	
M-1	Lecture, laboratory and practical classes
M-2	Lecture and Laboratory

Evaluation methods (F - progressive, P - final)		
S-1	F	Laboratory exercises and reports
S-2	P	Exam 1 and 2
S-3	F	Continuous assessment (laboratory)
S-4	P	Written exam (lecture)

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_C11_W01 Student demonstrates basic knowledge regarding genetic programs of fish selection	AQF_1A_W03 AQF_1A_W06 AQF_1A_W08	P6S_WG	P6S_WG	C-1	T-W-1 T-W-8 T-W-2 T-W-9 T-W-3 T-W-10 T-W-4 T-W-11 T-W-5 T-W-12 T-W-6 T-W-13 T-W-7 T-W-14	M-1	S-2 S-4

Skills							
AQF_1A_C11_U01 Is able to choose, prepare and apply the proper selection program for aquaculture species	AQF_1A_U07 AQF_1A_U14	P6S_UW		C-1	T-L-1 T-L-7 T-L-2 T-L-8 T-L-3 T-L-9 T-L-4 T-L-10 T-L-5 T-L-11 T-L-6	M-1	S-1 S-3

Social competences							
AQF_1A_C11_K01 Student is able to collect and interpret data from laboratory experiments and literature, prepare written experimental reports and present results of literature study using audiovisual ways.	AQF_1A_K01	P6S_KK P6S_KR		C-1	T-L-1 T-W-3 T-L-2 T-W-4 T-L-3 T-W-5 T-L-4 T-W-6 T-L-5 T-W-7 T-L-6 T-W-8 T-L-7 T-W-9 T-L-8 T-W-10 T-L-9 T-W-11 T-L-10 T-W-12 T-L-11 T-W-13 T-W-1 T-W-14 T-W-2	M-1	S-1 S-2

Outcomes	Grade	Evaluation criterion
Knowledge		
AQF_1A_C11_W01	2,0	
	3,0	Has a basic knowledge about programs of fish selection based on molecular markers
	3,5	
	4,0	
	4,5	
	5,0	



*Skills*

AQF_1A_C11_U01	2,0	
	3,0	Is able to choose, prepare and applicate the proper selection program.
	3,5	
	4,0	
	4,5	
	5,0	

*Other social competences*

AQF_1A_C11_K01	2,0	
	3,0	Student is able to finish all tasks during course with the help of the colleagues and a teacher.
	3,5	
	4,0	
	4,5	
	5,0	

*Required reading*

1. Zhanjiang (John) Liu, Aquaculture genome technologies, Blackwell Publishing, Ames, 2007, I
2. Zhanjiang L, Aquaculture genome technologies, Wiley-Blackwell, 2007
3. Beaumont A.R., Hoare K., Biotechnology and genetics in Fisheries and Aquaculture, Blackwell Science, Oxford, 2003

*Supplementary reading*

1. Aquaculture (journal)
2. Kocher T., Genome Mapping and Genomics in Fishes and aquatic animals, Springer, Berlin, 2008
3. Aquaculture research (journal)
4. Beaumont A.R., Hoare K., Biotechnology and genetics in fisheries and aquaculture., Blackwell Science, Oxford, 2003
5. Lekang O-I, Aquaculture engineering., Blackwell Science, Oxford, 2007