



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		Bioprocess and membran technology						
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		7	Elective group					
Form of instruction		Cod	Semester	Hours	ECTS	Weight	Credit	
laboratory course		L	4	30	3.0	0.50	credits	
lecture		W	4	30	3.0	0.50	examination	
Leading teacher		Tórz Agnieszka (Agnieszka.Torz@zut.edu.pl)						
Other teachers								
Prerequisites								
W-1		Students must have successfully completed organic and inorganic chemistry subjects						
Module/course unit objectives								
C-1		Students will develop their knowledge and understanding of microalgae biomass production and membrane separation methods used in technological processes.						
Course content divided into various forms of instruction							Number of hours	
T-L-1		Determining the level of deletion of biogenic elements and microalgae biomass accretion in the culture developed with the usage of the sample sewage and the technical sewage.					15	
T-L-2		Calculation of the total resistance, the membrane resistance, the resistance connected with reversible and irreversible fouling. The measurement of volumetric flux of permeate. Purification and concentration of model solution.					15	
T-W-1		The influence of such factors as water temperature, solar radiation, accessibility of biogenic elements, on the accretion of microalgae biomass.					15	
T-W-2		Membrane techniques - division of membranes; the membrane modules. Physical and chemical phenomena occurring during the membrane separation: creation of membrane fouling and factors influencing the process.					15	
Student workload - forms of activity							Number of hours	
A-L-1		Attendance					30	
A-L-2		Studying the literature on the subject					30	
A-L-3		Evaluation of the results received from the chemical experiments					20	
A-L-4		Consultation with the tutor					10	
A-W-1		Attendance					30	
A-W-2		Studying the literature on the subject					40	
A-W-3		Consultation with the tutor					20	
Teaching methods / tools								
M-1		Lecture and Laboratory (practical exercises)						
Evaluation methods (F - progressive, P - final)								
S-1		F	Continuous assessment					
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_C15b_W01 After the course student will gain knowledge of: • influence of biogenic elements on the growth of microalgae biomass, • membrane separation processes,	AQF_1A_W07	P6S_WG		C-1	T-L-1 T-L-2	T-W-1 T-W-2	M-1	S-1
--	------------	--------	--	-----	----------------	----------------	-----	-----

Skills

AQF_1A_C15b_U01 Student will be able to: • adjust conditions to increase growth of microalgae biomass, • conduct separation using ceramic membranes in order to concentrate technological medium	AQF_1A_U08	P6S_UW	P6S_UW	C-1	T-L-1 T-L-2	T-W-1 T-W-2	M-1	S-1
---	------------	--------	--------	-----	----------------	----------------	-----	-----

Social competences

AQF_1A_C15b_K01 Student will be able to design and conduct an experiment.	AQF_1A_K05	P6S_KK P6S_KR		C-1	T-L-1 T-L-2	T-W-1 T-W-2	M-1	S-1
--	------------	------------------	--	-----	----------------	----------------	-----	-----

Outcomes	Grade	Evaluation criterion						
----------	-------	----------------------	--	--	--	--	--	--

Knowledge

AQF_1A_C15b_W01	2,0	
	3,0	Student will be able to define membran processes
	3,5	
	4,0	
	4,5	
	5,0	

Skills

AQF_1A_C15b_U01	2,0	
	3,0	Student will be able to perform separation using membran technology
	3,5	
	4,0	
	4,5	
	5,0	

Other social competences

AQF_1A_C15b_K01	2,0	
	3,0	Student will be aware of the workplace safety rules
	3,5	
	4,0	
	4,5	
	5,0	

Required reading

1. Mukesh Doble, Anil Kumar Kruthiventi, Vilas Ganjanan Gaikar, Biotransformations and Bioprocesses, CRC Press, 2004
2. Alper, Hal S. (Ed.), Systems Metabolic Engineering, Humana Pres, 2013
3. Zhong, Jian-Jiang, Future Trends in Biotechnology, Humana Press, 2013
4. Fane A.G., Wang R., Jia Y., Membrane and desalination technologies. Volume 13, Handbook of Environmental Engineering., Published by Humana Press, 2011