## Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

## Faculty of Chemical Technology and Engineering

Field of study		Chem	nical Engineering							
Mode of study		static	nary	WTICh						
Graduate's qualification		inżyn	ier	W I 1I	Ch					
Area(s) of study		nauki	techniczne							
Educationa	al profile	gene	ral academic							
Module										
Course un	it	Intro	duction to Bio							
Code		ChEn	1A S C16a							
Field of sp	ecialisation									
Administering faculty		Instit Envir	ute of Inorganic onmental Engine							
ECTS		6,0 ECTS (forms) 6,0								
Form of course credit		credits		Language	english					
Electives		5 Elective group								
Form of in:	struction	Code	Semester	Hours	ECTS	Weight	Credit			
lecture		w	5	30	2,0	0,50	credits			
laboratory	course	L	5	45	4,0	0,50	credits			
l eading te	eacher	Mark	wska-Szczunak	Agata (Agata Ma	rkowska@zut edu pl)	,				
Other teachers		Marke (Rafa	Markowska-Szczupak Agata (Agata.Markowska@zut.edu.pl) Markowska-Szczupak Agata (Agata.Markowska@zut.edu.pl), Rakoczy Rafał (Rafal Rakoczy@zut.edu.pl) Sobolewski Piotr (psobolewski@zut.edu.pl)							
Prereauisit	tes	10.000	, , , , , , , , , , , , , , , , , , , ,							
W-1	Basic knowledge of	<sup>-</sup> biolog	y and chemistry (s	secondary school le	vel). Upper-intermediate	level of English.				
W-2	Actively engaging i	n lectu	re discussions, cla	ssroom activities, a	nd laboratory investigation	ons				
Module/co	urse unit obiective	<i>es</i>								
C-1	The program focuses on broadening student's knowledge and understanding of the current technologies and processes in the biotechnology industry, including approaches being applied to further advance the discovery and design of new and highly innovative biotechnology products.									
C-2	This is a multidisciplinary programme with the main aim to educate students within the field of applied biotechnology. Students in the programme will gain theoretical and practical competence within the broad field of biotechnology e.g. organic biotechnology, polymer biotechnology, industrial biotechnology. Also eethical aspects and the role of biotechnology in sustainable development will be discussed.									
Course cor	ntent divided into	variou	is forms of instru	ıction			Number of hours			
T-W-1	Introduction: defini		1							
T-W-2	Principles of cell bio		7							
T-W-3	GMO technology (microorganism, plants and animals)									
T-W-4	Drugs and vaccines obtained by biotechnology processing. Gene therapy.The potential application of steam cells.									
T-W-5	Applications of biotechnology in chemical technology.   3									
T-W-6	Polymer biotechnology. 2									
T-W-8	Biotechnology proc Basic reaction theo for biological syste	2								
T-W-9	KINETICS, KINETICS of cell death. Batch_fed-batch_and_continuous processes_Kinetics of reactions and scale-up of reactors4									
T-L-1	Microorganisms: is	5								
T-L-2	Microplate assays:	5								
T-L-3	Enzyme action: tes		5							
T-L-4	Microcapsules: immobilization of cells.									
T-L-5	Microbial biomass measurments in biotechnological process. 5									
T-L-6	DNA isolation. Elec		5							
T-L-7	Bioreactor designg	5								
T-L-8	The effects of temp	5								
T-L-9	Influence of the ma	5								

Student wo	Student workload - forms of activity Number of hours												
A-W-1	Participation in lectures and discussion									30			
A-W-2	Consultations									15			
A-W-3	Learning to the written test									15			
A-L-1	Particip		45										
A-L-2	Consul		15										
A-L-3	Indyvic		60										
Teaching methods / tools													
M-1	power point presentation lecture												
M-2	discussion during the lectures												
M-3	laboratory classes												
Evaluation methods (F - progressive, P - final)													
S-1	F Evaluation of attendance at laboratory classes and working in the laboratory.												
5-2	F	F Evaluation of knowledge and engagement in discussion during lectures and classes.											
	The component of the final grade are: 1) attendence at laboratory classes; 2) raports from laboratory classes												
	3)written test (optional); 4) written final (lecture test)												
5-3	Р	The grades from 1), 2) and 3) make t	the grade from t	he classes and	d with the wri	tten tes	t grade	they m	ake wei	ghted			
		mean, which is: (0.5 grade from the classes + 0.5 x c	arade from the w	ritten final te	st).								
	Desigr	ned learning outcomes	Reference to the learning outcomes designed for the fields of study	Reference to the learning outcomes defined for the particular areas of	Reference to learning outcomes leading to the degree of "inżynier"	Course objectives	Course content		Teaching methods	Evaluation methods			
Kanada				education									
Knowleage	2						Τι 1	T W 1		1			
ChEn_1A_C16a_W13 Has knowledge of the current state and the latest developmental trends in biotechnology.			ChEn_1A_W13 ChEn_1A_W15	P6S_WG_TA11	P65_WG_IA11	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-8 T-L-9	T-W-1 T-W-2 T-W-3 T-W-4 T-W-5 T-W-5 T-W-6 T-W-7 T-W-8 T-W-9	M-1 M-2 M-3	S-1 S-3			
ChEn_1A_C16a_W18 Student can determine the role of biotechnology processes in modern science and technology.			ChEn_1A_W13 ChEn_1A_W15	P65_WG_TA11	P65_WG_IA11	C-1	T-L-1 T-L-2 T-L-3 T-L-5 T-L-6 T-L-7 T-L-8 T-L-9 T-L-9 T-W-1	T-W-2 T-W-3 T-W-4 T-W-5 T-W-6 T-W-7 T-W-8 T-W-9	M-1 M-2 M-3	S-1 S-2 S-3			
Skills							-						
ChEn_1A_C16 Student is abl experiments a reports and po ways.	a_U01 e to colle and litera resent re	ect and interpret data from laboratory iture, prepare written experimental sults of literature study using audiovisual	ChEn_1A_U01 ChEn_1A_U03 ChEn_1A_U05 ChEn_1A_U08 ChEn_1A_U16	P6S_UO P6S_UU P6S_UW_TA11 P6S_UW_TA14	P6S_UW_IA11 P6S_UW_IA14	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-8 T-L-9 T-W-6 T-W-7 T-W-8 T-W-9	M-1 M-2 M-3	S-1 S-2 S-3			
Other socia	al / per	sonal competences											
ChEn_1A_C16 Student is abl in group.	a_K01 e to perf	orm all tasks on time, cooperate and work	ChEn_1A_K01 ChEn_1A_K03 ChEn_1A_K04 ChEn_1A_K05	P65_KK P65_KO P65_KR		C-1 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-8	T-L-9 T-W-3 T-W-4 T-W-5 T-W-6 T-W-7 T-W-7 T-W-8 T-W-9	M-2 M-3	S-1			
2. Ratledge 2nd	C., Kris	tiansen B.1. Ratledge C., Krist	iansen B., Basic	Biotechnology	, Cambridge	Univers	ity Pres	s,, Cam	bridge,	2006,			
3. Evans G.	M., Furl	ong J.C, Environmental Biotechnology	· : Theory and Ap	oplication, Wile	ey, 2003, 2nd								
4. McCabe W.L., Smith J.C. and Harriot P., Module Operations in Chemical Engineering, McGraw-Hill Professional, 2005, 7th													
5. Joined publication, Biotechnology and Biochemical Engineering, Wiley-VCH Verlag GmbH&Co, 2007, 1st													
Supplementary reading													
<ol> <li>Khoshmanesh K., Kouzani A.Z., Nahavandi S., Baratchi S., Kanwar J.R., At a glance: Cellular biology for engineers., Comput Biol Chem, 2008, 32(5):315-331. doi:10.1016/j.compbiolchem.2008.07.010.</li> <li>Lenz R.W, Marchessault R.H., Bacterial Polyesters: Biosynthesis, Biodegradable Plastics and Biotechnology., Biomacromolecules,</li> </ol>													
2005, 6(1):1-8. doi:10.1021/bm049700c         3. Biotechnology Journals Published by Elsevier, 2011													