

FACULTY OF CHEMISTRY					
SUBJECT CARD					
Name of subject in English:	Bioproducts separation and purification				
Main field of study (if applicable):	BIOTECHNOLOGY				
Specialization (if applicable):					
Profile:	academic				
Level and form of studies:	1 st level, 2nd level – supplementary semester, full-time				
Kind of subject:	obligatory				
Subject code:	BTC016022				
Group of courses:	NO				
	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)			30		
Number of hours of total student workload (CNPS)			60		
Form of crediting			crediting with grade		
For group of courses mark (X) final course					
Number of ECTS points			2		
including number of ECTS points for practical (P) classes			2		
including number of ECTS points for direct teacher-student contact (BK) classes			1		
<p>*PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES</p> <ol style="list-style-type: none"> 1. Knowledge of such courses as chemical engineering, microbiology, biochemistry. 2. Ability to manually operate laboratory equipment such as spectrophotometer, analytical balance, automatic pipettes. 3. The ability to create diagrams for different types of functions (by computer), determining the function equation. 					
<p style="text-align: center;">SUBJECT OBJECTIVES</p> <p>C1 Getting familiar with the composition (homo- and heterogeneous systems) and the approach to the separation of post-reaction streams.</p> <p>C2 Understanding the basics of using processes for the separation of heterogeneous systems.</p> <p>C3 Learning the basics of diffusion processes application.</p> <p>C4 Getting familiar with basic membrane techniques.</p> <p>C5 Understanding the principles of multi-stage separation process designing.</p>					
<p style="text-align: center;">SUBJECT EDUCATIONAL EFFECTS</p> <p>related to skills:</p> <p>PEK_U01 student is able to carry out an experiment on laboratory scale equipment, develop the obtained results and present them in the form of a written report.</p> <p>PEK_U02 student is able to purify biomolecules using a given separation method. He can measure the concentrations of the test ingredient and determine the degree of purification.</p> <p>PEK_U03 student can assess profits of a given separation method for a given application and apply known equations to describe its kinetics.</p> <p>related to social competences:</p> <p>PEK_K01 student is ready to critically evaluate his/her knowledge and received content</p> <p>PEK_K02 student is able to work in a group, performing various roles including group leader</p> <p>PEK_K03 student is aware of the importance of theoretical and practical knowledge acquired during the</p>					

course and is ready to apply his general and engineering skills in practice.		
PROGRAMME CONTENT		
Laboratory		Number of hours
Lab 1	Adsorption - determination and mathematical description of the adsorption rate and equilibrium state.	6
Lab 2	Extraction - determination of extraction kinetics and division coefficient in a batch system extraction (mixing); determination of working effectiveness in continuous system extraction (extraction column).	6
Lab 3	Flotation - determination of the enrichment and recovery factors gained during separation process.	6
Lab 4	Vacuum filtration - measuring the variability of the filtrate stream in time, description of the process with determination of compressibility index of the filter cake and determination of the liquid purification degree.	6
Lab 5	Sedimentation - determination of the sinking velocity of suspensions with different solid content. Distillation - determination of the composition of the distillate during periodic distillation duration, determination of the total alcohol mass obtained in the fermentation bottle subjected to distillation, process balance.	6
Number of hours		30
TEACHING TOOLS USED		
N1. Lecture N2. Performing the experiment N3. Description of results using computer graphics programs N4. Consultations		
EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT		
Evaluation (F – forming (during semester), P – concluding (at semester end))	Educational effect number	Way of evaluating educational effect achievement
F1-F5 (Laboratory classes)	PEK_U1 – PEK_03	Points for each classes - quiz + report (max 5 points for each lab)
$P(\text{laboratory}) = (F1 + F2 + F3 + F4 + F5 + F6)$ P = 3.0 if the sum of points is in the range of 60-67.9% 3.5 if the sum of points is in the range of 68-75.9% 4.0 if the sum of points is in the range of 76-83.9% 4.5 if the sum of points is in the range of 84-89.9% 5.0 if the sum of points is in the range of 90-98% 5.5 if the sum of points is > 98%		
F3		
P		
PRIMARY AND SECONDARY LITERATURE		
PRIMARY LITERATURE:		
[1] R. Gawroński- Procesy oczyszczania cieczy- Oficyna Wydawnicza Politechniki Warszawskiej, W-wa 1996		
[2] Pod redakcją P. Lewickiego- Inżynieria procesowa i aparatura przemysłu spożywczegoWyd.		

Naukowo-Techniczne, W-wa 1999

[3] E. Pijanowski, M. Dłużewski – Ogólna technologia żywności – Wyd. NaukowoTechniczne, W-wa 1997

[4] R. Rautenbach – Procesy membranowe, Wyd. Naukowo-Techniczne, W-wa 1996

SUPPLEMENTARY LITERATURE:

[5] W.W. Blanch, D.S. Clark – Biochemical Eng.- rozdz.6, NY 1996

[6] P. Better, E. Cussler – Bioseparations-downstream processing for biotechnology – Wiley&Sons Publication 1988

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

ANNA TRUSEK, anna.trusek@pwr.edu.pl
DAMIAN SEMBA, damian.semba@pwr.edu.pl