

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Neutralization and Recovery of Organic Industry Wastes		Code 1010702321010721752
Field of study Technologie ochrony środowiska - stacjonarne	Profile of study (general academic, practical) (brak)	Year /Semester 1 / 2
Elective path/specialty Ecotechnology	Subject offered in: Polish	Course (compulsory, elective) obligatory
Cycle of study: Second-cycle studies	Form of study (full-time, part-time) full-time	
No. of hours Lecture: 2 Classes: - Laboratory: 3 Project/seminars: 1		No. of credits 8
Status of the course in the study program (Basic, major, other) (brak)		(university-wide, from another field) (brak)
Education areas and fields of science and art technical sciences Technical sciences		ECTS distribution (number and %) 8 100% 8 100%
Responsible for subject / lecturer: prof. dr hab. inż. Juliusz Pernak email: juliusz.pernak@put.poznan.pl tel. (61) 6653682 Faculty of Chemical Technology ul. Piotrowo 3, 60-965 Poznań		
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	Student has knowledge of chemical technology and environmental engineering. Student knows the basic methods, techniques and tools used in chemical technology.
2	Skills	Student can obtain information from literature, databases and other sources. Student is able to interpret the information, draw conclusions and formulate opinions.
3	Social competencies	Students can interact and work in a group. Students can appropriately prioritize used to perform a particular task.
Assumptions and objectives of the course: Obtaining knowledge of chemical technology.		
Study outcomes and reference to the educational results for a field of study		
Knowledge:		
1. Student knows the basic rules of conduct neutralization and recycling of waste organic industry. - [K_W08]		
2. Student has knowledge of the development trends and new developments in the field of environmental technology. - [K_W16]		
Skills:		
1. Student has the skills to identify the direction for the neutralization and disposal of non-standard organic industrial waste. - [K_U11]		
2. Student can point out ways to utilize various organic industrial waste - [K_U17]		
Social competencies:		
1. Student is able to work independently and in a team. - [K_K02]		
Assessment methods of study outcomes		
Current control during laboratory classes, colloquia on projects, final written examination.		
Course description		

Technology neutralization (to prevent contamination, clean technology, methods, applications and examples of technology solutions, product life cycle). Odour (source, chemistry of aromatic compounds, neutralization by direct oxidation with ozone, examples of solutions). The oxidation process (chemical process, waste products, waste and catalysts, examples of neutralization and recycling of waste). The nitration and esterification (the structure of organic compounds, neutralization and recycling of waste). Clean coal technology.

Basic bibliography:

1. E. Grzywa, J. Molenda: Technologia podstawowych syntez organicznych, WNT, Warszawa 1987.
2. K. Weissmehl, H.J. Arpe: Industrial organic chemistry, VCH, Weinheim, New York, Basel, Cambridge, Tokio, 1993.
3. R.P. Schwarzenbach, P.M. Gschwend, D.M. Imboden: Environmental organic chemistry, J. Willey, 1993.
4. B. Burczyk: Biomasa.Surowiec do syntez chemicznych i produkcji paliw, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2011.

Additional bibliography:

1. P. Pollak: Fine chemicals. The industry and the business, Willey, 2011.
2. B. Burczyk: Zielona chemia. Zarys, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2006.

Result of average student's workload

Activity	Time (working hours)	
1. Lectures	30	
2. Laboratory	45	
3. Participation in the project	15	
4. Preparation for laboratory	45	
5. Implementation of the project	20	
6. Participation in the consultation	30	
7. Exam (preparation and the presence of the examination)	15	
Student's workload		
Source of workload	hours	ECTS
Total workload	200	8
Contact hours	120	5
Practical activities	80	3