

FACULTY OF CHEMISTRY					
SUBJECT CARD					
Name of subject in Polish	Odzysk i recykling materiałów				
Name of subject in English	Material recovery and recycling				
Main field of study (if applicable):	all field 2 nd level				
Specialization (if applicable):					
Profile:	academic				
Level and form of studies:	2nd level – supplementary semester, full-time				
Kind of subject:	obligatory				
Subject code	W03W03-SM2027W				
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)	50				
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					
including number of ECTS points for direct teacher-student contact (BU) classes	1,3				
PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES					
1. General Chemistry					
\SUBJECT OBJECTIVES					
C1 To familiarize students with the basic terminology of waste					
C2 To familiarize students with the structure and systems of waste collection.					
C3 To familiarize students with the basic methods of waste management.					
C4 Awakening of environmental awareness.					
SUBJECT EDUCATIONAL EFFECTS					
In the field of knowledge:					
A person who has passed the examination:					
PEU_W01 – Student knows the basic terminology associated with waste management.					
PEU_W02 – Student has a basic knowledge about the symbols and designations used to label the materials for recycling.					
PEU_W03 – Student has a basic knowledge of the collection and distribution systems of waste materials.					
PEU_W04 – Knows the basic legal conditions for recycled materials.					
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PROGRAMME CONTENT					
Lectures					Number of hours
Lec1	Selective collection systems. The division, the definition and sources of municipal waste and hazardous waste. Principles of waste management, basic definitions related to waste management. Logistics, waste recycling, its advantages and disadvantages, problems. Examples.				2
Lec2	Classification, labeling materials. The overall breakdown of characters and graphic symbols used to mark the packaging, recycling signs, signs indicating the				2

	proper waste handling.	
Lec3	Waste management in Poland, part 1: Material Recycling - definition, elements of the system, the barriers in the recycling process, the criteria for suitability for recycling.	2
Lec4	Waste management in Poland, part 2: Material recycling - European standards (applicable in Poland), heavy metals in the raw materials from recycling, recycling of paper and cardboard, recycling of glass packaging, metal packaging recycling, recycling of timber packaging and multimaterial packaging.	2
Lec5	Waste management in Poland, part 3: Material recycling - recycling of plastic packaging.	2
Lec6	Waste management in Poland, part 4 Feedstock recycling - definition, criteria for suitability for recycling of raw materials, disadvantages, advantages. Thermal and solvolytic processes used in the recycling of raw materials, examples.	2
Lec7	Biological treatment part 1: Composting. The legal basis, advantages and disadvantages, the criteria for the use of composting, limitations and conditions of composting, discuss progress and process parameters (pH, temperature, microorganisms).	2
Lec8	Biological treatment, part 2: Methane fermentation. Definition, classification, advantages, disadvantages, differences between composting and fermentation, fermentation steps, the most important parameters and microorganisms involved in the fermentation process. Fermentation methods one and two-stage, advantages and disadvantages. The substrates and products.	2
Lec9	Incineration of waste. Basic problems of waste incineration plants, safety, advantages and disadvantages.	1
Lec10	Hazardous waste, part 1 - Definition, classification, origin. Methods of dealing with pharmaceuticals, batteries, fluorescent lamps, mercury-containing waste, appliances containing freon, electronics.	2
Lec11	Hazardous waste, part 2 – Legislation. Disposal of used oils. Proceedings of vehicles spent product.	2
Lec12	Analysis of the life cycle of consumables. For selected examples – production, operation, recovery (home appliances, AGD).	2
Lec13	Waste management in selected countries.	2
Lec14	Efforts to improve the situation in the field of waste management. Shares information and education, legal, collection and transport, recovery, disposal.	2
Lec15	Ethical problems related to the production and consumption.	2
Lec 16	Course credit	1
	Total hours	30
TEACHING TOOLS USED		
N1. Multimedia presentation N2. Discourse		
EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT		
Evaluation (F – forming (during semester), P – concluding (at semester end))	Learning outcomes number	Way of evaluating learning outcomes achievement
P1 (lecture)	PEU_W01- PEU_W04,	test

PRIMARY AND SECONDARY LITERATURE	
BASIC LITERATURE:	
[1] Systemy recyklingu odpadów opakowaniowych w asPEUcie wymagań ochrony środowiska / Hanna Żakowska, Wydawnictwo Akademii Ekonomicznej, 2008	
[2] Odpady komunalne: zbiórka, recykling, unieszkodliwianie odpadów komunalnych i komunalnopodobnych, Wydawnictwo Politechniki Krakowskiej, 2005	
[3] Procesy logistyczne w gospodarce odpadami / Józef Bendkowski, Maria Wengierek, Wydawnictwo Politechniki Śląskiej, 2002	
SUPPLEMENTARY LITERATURE:	
[4] Odzysk ciepła w procesie termicznej utylizacji odpadów medycznych / Janusz Wojciech Bujak, oficyna Wyd.Politechniki Wrocławskiej, 2010	
[5] Wybrane zagadnienia recyklingu samochodów, Jerzy Osiński, Piotr Żach, Wydawnictwa Komunikacji i Łączności, 2006	
SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)	
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