

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Industrial Waste-Solids Management		Code 1010135231010100332
Field of study Enviromental Engineering Extramural Second-	Profile of study (general academic, practical) (brak)	Year /Semester 2 / 3
Elective path/specialty Water Suply, Water Soil Protection	Subject offered in: Polish	Course (compulsory, elective) obligatory
Cycle of study: Second-cycle studies	Form of study (full-time,part-time) part-time	
No. of hours Lecture: 10 Classes: 8 Laboratory: - Project/seminars: 16		No. of credits 3
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		ECTS distribution (number and %) 3 100%
Responsible for subject / lecturer: Piotr Oleśkiewicz-Popiel, PhD email: piotr.oleskowicz-popiel@put.poznan.pl tel. +48 61 665 3498 Faculty of Civil and Environmental Engineering ul. Piotrowo 5, 60-965 Poznań; tel.: (61) 6652413, 6652900		Responsible for subject / lecturer: Piotr Krajewski, Ph.D. email: piotr.krajewski@put.poznan.pl tel. +48 61 665 3498 Faculty of Civil and Environmental Engineering ul. Piotrowo 5, 60-965 Poznań; tel.: (61) 6652413, 6652900
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	Basic knowledge about chemistry, environmental biology, ecology and general knowledge from environmental engineering.
2	Skills	Ability for searching valuable information. Reading research articles and reports with understanding. Ability to use existing knowledge and its application in a new perspective. Basic principles of working in a group and writing a project reports.
3	Social competencies	Awareness to constantly update and supplement knowledge and skills.
Assumptions and objectives of the course: The course is dealing with problems concerning waste management of solid wastes and their utilization. The objective of the course is to develop skill on waste management planning, waste segregation, mechanic-, thermal- and biological- treatment, and landfilling of waste.		
Study outcomes and reference to the educational results for a field of study		
Knowledge:		
1. Student has structured and theoretically founded knowledge of the existing waste management systems. - [K_W03, K_W04, K_W05, K_W07]		
2. Student has structured and theoretically founded knowledge in terms related to the generation of waste: waste source, waste types, fractions of waste segregation at the source. - [K_W03, K_W04, K_W05, K_W07]		
3. Student knows and understands the role of properly designed waste management systems. - [K_W01, K_W03, K_W04, K_W05, K_W06, K_W07, K_W08]		
4. Student knows and understands the consequences of wrongly designed waste management systems. - [K_W01, K_W03, K_W04, K_W05, K_W06, K_W07, K_W08]		
5. Student knows and understands the basic technologies used in waste management systems - [K_W03, K_W04, K_W05, K_W07]		
6. Student knows the basics of multi-criteria assessment of waste management systems. - [K_W01, K_W03, K_W04, K_W06, K_W07]		
Skills:		

<p>1. Student is able to plan waste management system in accordance with the demand in the region. - [K_U01,K_U02,K_U03, K_U05,K_U10, K_U13,K_U14, K_U15]</p> <p>2. Student is able to design and explain the system of collection, transport and transfer of waste. - [K_U01, K_U03, K_U10, K_U13, K_U14]</p> <p>3. Student can describe the waste treatment technologies and explain the associated physical, chemical and biological processes. - [K_U01, K_U04, K_U10, K_U14]</p> <p>4. Student can describe recycling technologies for important fractions of waste. - [K_U01, K_U04, K_U10, K_U14]</p> <p>5. Student can describe the waste disposal technologies and explain the associated physical, chemical and biological processes. - [K_U01, K_U04, K_U10, K_U14]</p> <p>6. Student can describe important aspects related to resource use and emissions associated with the collection, treatment, recycling and disposal of waste, and describe their impact on the environment. - [K_U01, K_U04, K_U10, K_U14]</p>
<p>Social competencies:</p> <p>1. Student understands the need for teamwork in solving theoretical and practical problems. - [K_K03]</p> <p>2. Student understands the different roles in a teamwork and the need for information and knowledge exchange in a group work. - [K_K03, K_K04]</p> <p>3. Student is aware of the need for sustainable development in waste management systems. - [K_K02, K_K07]</p> <p>4. Student understands the need for a systematic deepening and broadening his/her competences. - [K_K01]</p>

Assessment methods of study outcomes	
<p>Joint assessment from lectures and projects:</p> <ul style="list-style-type: none"> - evaluation of the project report (30%) - presentation of the project (30%) - defending the project + general questions from waste management (30%) - activity (10%) - failure of on the above mentioned assessment components disqualifies for the entire course. 	
Course description	
<p>Basic concepts of waste management: waste generation, the amount and composition, collection and segregation of waste, recycling and reuse, incineration, biological treatment (composting, biogas production), waste disposal, waste management regulations, the impact of waste on the environment.</p> <p>Projects:</p> <p>Students will be divided into groups of about 4-6 (depending on the number of students in groups) within which they will work on solving the waste management problem for specific town/city based on the knowledge acquired from the lectures and literature. Additionally, the following soft skills will be acquired: working in groups, sharing tasks, searching for valuable information, writing reports, presenting the results.</p>	
<p>Basic bibliography:</p> <p>1. Rosik-Dulewska Cz. (2011): Podstawy gospodarki odpadami, Wydawnictwo Naukowe PWN, Wydanie piąte uaktualnione (ISBN 978-83-01-16353-2)</p> <p>2. Christensen T. H.: Solid waste technology & Management. Wiley Blackwell Publishing Ltd., 2011, ISBN 9781405175173.</p>	
<p>Additional bibliography:</p> <p>1. A. Laurent, I. Bakas, J. Clavreul, A. Bernstad, M. Niero, E. Gentil, M. Z. Hauschild, T. H. Christensen: Review of LCA studies of solid waste management systems ? Part I: Lessons learned and perspectives. Waste Management 34 (2014) 573?588.</p> <p>2. A. Laurent, J. Clavreul, A. Bernstad, I. Bakas, M. Niero, E. Gentil, T. H. Christensen, M.Z. Hauschild: Review of LCA studies of solid waste management systems ? Part II: Methodological guidance for a better practice. Waste Management 34 (2014) 589?606.</p> <p>3. L. Lombardi, E. Carnevale, A. Corti: A review of technologies and performances of thermal treatment systems for energy recovery from waste. Waste Management 37 (2015) 26?44.</p>	
Result of average student's workload	
Activity	Time (working hours)
1. Participation in lectures	20
2. Participation in project work	20
3. Consultation with the lecturer	3
4. Report preparation (work at home)	45
5. Exam	2
Student's workload	

Source of workload	hours	ECTS
Total workload	90	3
Contact hours	45	2
Practical activities	45	1