STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Industrial Waste-Solids Management		**1010102231010100332**
Field of study	Profile of study (general academic, practical)	Year /Semester
Environmental Engineering Second-cycle	**(brak)**	**2 / 3**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
Water Supply, Water and Soil Protection	**Polish**	**obligatory**
Cycle of study:	Form of study (full-time,part-time)	
Second-cycle studies	**full-time**	

No. of hours				No. of credits
Lecture: **15**	Classes: **15**	Laboratory: **-**	Project/seminars: **30**	**4**

Status of the course in the study program (Basic, major, other)	(university-wide, from another field)
(brak)	**(brak)**

Education areas and fields of science and art	ECTS distribution (number and %)
technical sciences	**4 100%**
Technical sciences	**4 100%**

Responsible for subject / lecturer:

Piotr Oleśkowicz-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 Krajewsji, 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. (lecture) - [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. (lecture) - [K_W03, K_W04, K_W05, K_W07]
3. Student knows and understands the role of properly designed waste management systems. (exercise) - [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. (exercise) - [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 (lecture) - [K_W03, K_W04, K_W05, K_W07]
6. Student knows the basics of multi-year assessment of waste management systems. (lecture) - [K_W01, K_W03, K_W04, K_W06, K_W07]
7. Student knows the basics of multi-criteriaassessment of waste management systems. (lecture) - [K_W01, K_W03, K_W04, K_W06, K_W07]

Skills:

1. Student is able to plan industrial waste management system in accordance with the demand in the region. (exercise) - [[K_U01(e),K_U04(e),K_U05(e),K_U10(e),K_U15(e)]]
2. Student is able to design and explain the system of collection, transport and transfer of industrial waste. (exercise) - [[K_U01(e),K_U10(e)]]
3. Student can describe the industrial waste treatment technologies and explain the associated physical, chemical and biological processes. (exercise) - [[K_U01(e),K_U10(e),K_U14(e)]]

Social competencies:

1. Student understands the need for teamwork in solving theoretical and practical problems. (exercise) - [K_K03]
2. Student understands the different roles in a teamwork and the need for information and knowledge exchange in a group work. (exercise) - [K_K03, K_K04]
3. Student is aware of the need for sustainable development in waste management systems. (lecture, exercise) - [K_K02, K_K07]
4. Student understands the need for a systematic deepening and broadening his/her competences. (lecture) - [K_K01]

Assessment methods of study outcomes

Joint assessment from lectures and projects:

- 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

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.

Projects:

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.

Methodology: informative and interactive lecture, lecture with ppt presentation, activation and problem-based lecture. Exercise: problem-based, case study, group work, problem solving, data interpretation.

Basic bibliography:

1. Rosik-Dulewska Cz. (2011): Podstawy gospodarki odpadami, Wydawnictwo Naukowe PWN, Wydanie piąte uaktualnione (ISBN 978-83-01-16353-2)
2. Christensen T. H.: Solid waste technology & Management. Wiley Blackwell Publishing Ltd., 2011, ISBN 9781405175173.

Additional bibliography:

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.
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.

Result of average student's workload

Activity	Time (working hours)
1. Participation in lectures	30
2. Participation in project work	30
3. Consultation with the lecterer	3
4. Report preparation (work at home)	27
5. Preparation for exam	30

Student's workload

Source of workload	hours	ECTS
Total workload	100	4
Contact hours	60	2

Practical activities	40	2