

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Wastewater		Code 1010101251010101346
Field of study Environmental Engineering First-cycle Studies	Profile of study (general academic, practical) (brak)	Year /Semester 3 / 5
Elective path/specialty -	Subject offered in: Polish	Course (compulsory, elective) obligatory
Cycle of study: First-cycle studies	Form of study (full-time, part-time) full-time	
No. of hours Lecture: 15 Classes: - Laboratory: - Project/seminars: 15		No. of credits 2
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 %) 2 100%
Responsible for subject / lecturer: Piotr Oleśkiewicz-Popiel, PhD email: piotr.oleskowicz-popiel@put.poznan.pl tel. +48 61 665 3661 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(l),K_W05(l),K_W07(l)] - [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(l),K_W05(l),K_W07(l)] - [K_W03, K_W04, K_W05, K_W07]		
3. Student knows and understands the role of properly designed waste management systems. (lecture, exercise). - [K_W01(e),K_W03(e),K_W05(e),K_W07(e),K_W08(l)] - [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.(lecture, exercise). - [K_W01(e),K_W03(e),K_W05(e),K_W07(e),K_W08(l)] - [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, exercise). - [K_W03(l),K_W05(l),K_W07(l)] - [K_W03, K_W04, K_W05, K_W07]		
6. Student knows the basics of multi-year assessment of waste management systems.(exercise). - [K_W01(l),K_W03(l),K_W06(l),K_W07(l),K_W08(l)] - [K_W01, K_W03, K_W04, K_W06, K_W07]		
7. Student knows the basics of multi-criteria assessment of waste management systems.(exercise). - [K_W01(l),K_W03(l),K_W06(l),K_W07(l),K_W08(l)] - [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. (exercise). - [K_U01(e),K_U04(e),K_U05(e),K_U10(e),K_U15(e)] - [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.(lecture, exercise). - [K_U01(e),K_U03(e),K_U10(e),K_U13(e)] - [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. (lecture, exercise). - [K_U01(e),K_U10(e),K_U14(e)] - [K_U01, K_U04, K_U10, K_U14]</p> <p>4. Student can describe recycling technologies for important fractions of waste.(lecture). - [K_U01(e),K_U10(e),K_U14(e)] - [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.(lecture). - [K_U01(e),K_U10(e),K_U14(e)] - [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. (lecture, exercise). - [K_U01(e),K_U10(e),K_U14(e)] - [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.(exercise). - [K_K03(e)] - [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. (exercise). - [K_K03(e), K_K04(e)] - [K_K03, K_K04]</p> <p>3. Student is aware of the need for sustainable development in waste management systems. (lecture, exercise). - [K_K02(e), K_K07(e)] - [K_K02, K_K07]</p> <p>4. Student understands the need for a systematic deepening and broadening his/her competences. (lecture, exercise). - [K_K01(l)] - [K_K01]</p>

<p>Assessment methods of study outcomes</p>
<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.
<p>Course description</p>
<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>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.</p>
<p>Basic bibliography:</p> <ol style="list-style-type: none"> 1. Rosik-Dulewska Cz. (2011): Podstawy gospodarki odpadami, Wydawnictwo Naukowe PWN, Wydanie piąte uaktualnione (ISBN 978-83-01-16353-2) 2. Jędrzak A. (2008): Biologiczne przetwarzanie odpadów, Wydawnictwo Naukowe PWN (ISBN 978-83-01-15166-9). 3. Christensen T. H.: Solid waste technology & Management. Wiley Blackwell Publishing Ltd., 2011, ISBN 9781405175173.
<p>Additional bibliography:</p> <ol style="list-style-type: none"> 1. E. den Boer , A. Jędrzak, Z. Kowalski, J. Kulczycka, R. Szpadt: A review of municipal solid waste composition and quantities in Poland. Waste Management 30 (2010) 369?377. 2. M. E. Edjabou, M. B. Jensen, R. Götz, K. Pivnenko, C. Petersen, Ch. Scheutz, T. Fruergaard Astrup: Municipal solid waste composition: Sampling methodology, statistical analyses, and case study evaluation. Waste Management 36 (2015) 12?23. 3. M. Fujii, T. Fujita, X. Chen, S. Ohnishi, N. Yamaguchi: Smart recycling of organic solid wastes in an environmentally sustainable society. Resources, Conservation and Recycling 63 (2012) 1? 8. 4. Pires, G. Martinho, N.B. Chang: Solid waste management in European countries: A review of systems analysis techniques. Journal of Environmental Management 92 (2011) 1033-1050. 5. 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</p>

Activity		Time (working hours)
1. Participation in lectures		15
2. Participation in project work		15
3. Consultation with the lecturer		3
4. Report preparation (work at home)		17
5. Preparation for exam		5
6. Project defense		5
Student's workload		
Source of workload	hours	ECTS
Total workload	60	2
Contact hours	30	1
Practical activities	30	1