



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Waste management [N1IŚrod2>GO]

### Course

Field of study

Environmental Engineering

Year/Semester

4/7

Area of study (specialization)

–

Profile of study

general academic

Level of study

first-cycle

Course offered in

Polish

Form of study

part-time

Requirements

compulsory

### Number of hours

Lecture

20

Laboratory classes

0

Other

0

Tutorials

0

Projects/seminars

10

### Number of credit points

3,00

### Coordinators

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### Lecturers

### Prerequisites

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.

### Course objective

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.

### Course-related learning outcomes

Knowledge:

1. Student has structured and theoretically founded knowledge of the existing waste management systems.
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.
3. Student knows and understands the role of properly designed waste management systems.
  4. Student knows and understands the consequences of wrongly designed waste management systems.
  5. Student knows and understands the basic technologies used in waste management systems.
  6. Student knows the basics of multi-year assessment of waste management systems.
  7. Student knows the basics of multi-criteria assessment of waste management systems.
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#### Skills:

1. Student is able to plan waste management system in accordance with the demand in the region.
2. Student is able to design and explain the system of collection, transport and transfer of waste.
3. Student can describe the waste treatment technologies and explain the associated physical, chemical and biological processes.
4. Student can describe recycling technologies for important fractions of waste.
5. Student can describe the waste disposal technologies and explain the associated physical, chemical and biological processes.
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.

#### Social competences:

1. Student understands the need for teamwork in solving theoretical and practical problems.
2. Student understands the different roles in a teamwork and the need for information and knowledge exchange in a group work.
3. Student is aware of the need for sustainable development in waste management systems.
4. Student understands the need for a systematic deepening and broadening his/her competences.

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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.

### Programme content

3

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.

### Course topics

none

### Teaching methods

Informative and interactive lecture, lecture with ppt presentation, activation and problem-based

lecture. Exercise: problem-based, case study, group work, problem solving, data interpretation.

## Bibliography

### Basic:

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.

### Additional:

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) 369377.
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) 1223.
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.

## Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	45	2,00