



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Sewage Treatment

Course

Field of study

Environmental Protection Technologies

Area of study (specialization)

Ecotechnology

Level of study

Second-cycle studies

Form of study

full-time

Year/Semester

I/1

Profile of study

general academic

Course offered in

Polish

Requirements

compulsory

Number of hours

Lecture

15

Laboratory classes

30

Other (e.g. online)

0

Tutorials

15

Projects/seminars

0

Number of credit points

4

Lecturers

Responsible for the course/lecturer:

dr hab. Małgorzata Osińska

Responsible for the course/lecturer:

Prerequisites

Basic knowledge of chemistry, physics and mathematics from the elevated degree studies in the fields: chemical technology, environmental technology, chemical and process engineering or other related fields.

Knows the basic methods, techniques, tools and materials used in solving simple engineering tasks. He knows the rules for the protection of the environment associated with chemical production.

Has knowledge of raw materials, products and processes used in the chemical industry also has basic information on the design, construction chemical energy.

Can work individually and in teams, able to plan and carry out experiments, interpreted the results and draw conclusions.

Understand the need for continuous training and are aware of their responsibility for collaborative tasks related to teamwork



Course objective

Gaining knowledge of the treatment of industrial wastewater with particular reference to toxic substances. Getting familiar with the technology used to liquidation or disposal of pollutants contained in the wastewater. Knowledge of methods of waste disposal and emissions produced during wastewater treatment processes. Skills of the laboratory experiments of wastewater treatment technologies.

Course-related learning outcomes

Knowledge

1. Knows the basic rules of procedure in the neutralization of the impact of pollutants on the environment [K_W07].
2. Knows the basic rules of waste disposal and recycling of industrial waste - [K_W08]
3. Has detailed knowledge of technological solutions for environmental protection - [K_W13]

Skills

1. Can point out different methods of industrial waste utilization - [K_U09]
2. Can propose improvements to existing technological solutions in environmental protection, taking into account new applicable legal acts - [K_U13]
3. Has the skills to indicate the direction for the neutralization and disposal of atypical industrial waste - [K_U12]

Social competences

1. Able to critically evaluate and verify the experimental results - [K_K02].
2. Is aware of emergence of moral and ethics problems in the context of professional activity - [K_K05]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Evaluation of written answers in the subjects related to the theme of the laboratory.

Current check of the knowledge and practical skills, correction of conducting experiments during the laboratory.

Assessment of oral response and activity in the course of classes.

Design of the installation of waste neutralization for a given process.

A written final exam.

Programme content

1. Indicators of water pollutions, the legal standards relating to water and wastewater.
2. Technologies of neutralization of waste water containing heavy metals
3. Coagulation and flocculation processes used for the purification of waste water.



4. Adsorption and its application in wastewater treatment technologies.
5. Application of ion exchange processes.
6. The oxidation methods in wastewater treatment, neutralization of cyanides connected with the recovery of selected metals.
7. Neutralization and recovery of chromium from chromium waste.
8. Flocculation and its application to wastewater treatment.
9. Management of waste produced in the process of neutralization.
10. Galvanization and neutralization technologies (periodic, continuous, Lancy).
11. The calculations relevant for the chosen methods of waste water neutralization in metal finishing plant (consumption of reagents, processes, the proposed method of neutralization, amount of generated wastes)
12. Design calculations of ion exchangers.
13. Design principles of neutralization station for selected processes.
14. Laboratories: students carry out wastewater treatment with ammonium ions and some heavy metals (combined with the analysis of emissions that occur during the processes and the possibilities of recovery, neutralization of wastewater containing toxic materials, application of electrochemical methods).

Teaching methods

Lecture, problem lecture, explanation, didactic discussion, classes, project method, laboratory exercises

Bibliography

Basic

1. A. Anielak, Chemiczne i fizykochemiczne oczyszczanie ścieków, Wyd. Naukowe PWN, Warszawa 2002.
2. B. Bartkiewicz, Oczyszczanie ścieków przemysłowych, Wyd. Naukowe PWN, Warszawa 2007.
3. J. Łomotowski, A. Szpindor, Nowoczesne systemy oczyszczania ścieków, Arkady, Warszawa 2002.
4. T. Stefanowicz, Gospodarka wodno-ściekowa i odpadowa w przemyśle elektrochemicznym, Wyd. Politechniki Poznańskiej, Poznań 2001.
5. T. Stefanowicz, Otrzymywanie i odzysk metali i innych surowców ze ścieków galwanicznych, Wyd. Politechniki Poznańskiej, Poznań, 1992.



Additional

1. L.K Wang, N.K. Shamma, Y.-T. Hung (eds) Advances in Hazardous Industrial Waste Treatment CRC Press, Taylor and Francis Group, Boca Raton Fl. USA 2009.
2. J. Coca-Prados, G. Gutiérrez-Cervelló (eds), Water Purification and Management, Springer, 2011.
3. S.A.K.Palmer, M.A.Breton, T.J.Nunno, D.M.Sullivan, N.F.Surprenant, Metal/Cyanide Containing Wastes Treatment Technologies, Pollution Technology Review No 158, Noyes Data Co, Park Ridge, New Jersey, 1988.
4. N.P.Cheremisinoff, Handbook of Water and Wastewater Treatment Technologies, Butterworth-Heinemann, U.S.A. 2002.

Breakdown of average student's workload

	Hours	ECTS
Total workload	120	4,0
Classes requiring direct contact with the teacher	75	2,5
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) ¹	45	1,5

¹ delete or add other activities as appropriate