



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Management of industrial sewage [S1TOZ1>GŚP]

### Course

Field of study

Circular System Technologies

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

full-time

Requirements

compulsory

### Number of hours

Lecture

15

Laboratory classes

0

Other

0

Tutorials

0

Projects/seminars

0

### Number of credit points

1,00

### Coordinators

dr hab. Małgorzata Osińska

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### Lecturers

### Prerequisites

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.

### Course objective

Gaining knowledge of the treatment of industrial wastewater with particular reference to recycling and recovery of materials. 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.

### Course-related learning outcomes

Knowledge:

has basic knowledge of the processes of neutralization and recovery of industrial and municipal waste [k\_w07]

has knowledge of the negative impact of manufacturing and processing technologies on the natural environment [k\_w08]

has knowledge of the physical and chemical basis of unit operations of closed-cycle technology [k-w22]

#### Skills:

has the ability to self-educate, is able to use source information in polish and a foreign language in accordance with the principles of ethics, reads with understanding, conducts analyzes, syntheses, summaries, critical assessments and correct conclusions [k\_u04]

can assess the usefulness and select tools and methods to solve problems in the field of closed-cycle technology [k\_u12]

#### Social competences:

supports the idea of a harmonious, global civilization-economic development, promoting the principles of closed-cycle technology, sustainable development and rational management of natural environment resources on a local and global scale [k\_k09]

is aware of the negative impact of human activity on the state of the environment and actively prevents its degradation [k\_k10]

understands the need to convey to society - incl. through the mass media - full information about the benefits and challenges related to the implementation of the closed-cycle technology concept [k\_k11]

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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The knowledge acquired during the lecture is verified by a written final test in the subject consisting of 3-5 questions. Passing threshold: 51% of the maximum number of points.

In the case of on-line classes, the final test of knowledge will take the form of a test consisting of 10 - 20 test questions and/or a few open questions. Passing threshold: 50% of the maximum number of points.

### Programme content

Methods of neutralization and utilization of pollutants and wastewater. Methods of reducing the amount of generated sewage. Technologies for the neutralization of selected types of industrial wastewater.

### Course topics

Indicators of water and sewage pollution and the effects of toxic substances on organisms

Neutralisation of sewage from commercial glassworks

Precipitation methods in sewage treatment

Coagulation and flocculation for treating sewage from the engineering industry

Ion exchange in wastewater treatment

Adsorption methods in wastewater treatment

Flotation, reverse osmosis and electrodialysis with examples of applications in wastewater treatment

### Teaching methods

Lecture, explanation

### 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 2008.

#### Additional

1. L.K Wang, N.K. Shamas, 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. 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	25	10,00
Classes requiring direct contact with the teacher	16	0,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	9	0,50