COURSE DESCRIPTION CARD - SYLLABUS

Course name
Ecological Electrochemistry

Course

Field of study
Environmental Protection Technologies
Year/Semester
I/2
Area of study (specialization)
Ecotechnology
Profile of study
general academic
Level of study
Second-cycle studies
Course offered in
polish
Form of study
full-time
Requirements
compulsory

Number of hours

Lecture
30
Laboratory classes
0
Other (e.g. online)
0
Tutorials
30
Projects/seminars
0

Number of credit points

7

Lecturers

Responsible for the course/lecturer:
dr hab. Piotr Krawczyk, prof. PP

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.

Student 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.

Course objective

The aim of the course is to transfer of knowledge of selected parts of electrochemical technology involving ecological save methods of synthesis of chemical compounds, their utilisation and recycling, the application of electrochemical methodes for waste water treatments and water protection against heavy metals and organic compounds, electrochemical methodes of energy generation, conversion and storage by direct and hybrid methods. Transfer of knowledge associated with corrosion phenomenon and its electrochemical aspects.

Course-related learning outcomes

Knowledge

1. Student has a theoretically grounded detailed knowledge involving the selected issues in the field of environmental protection [K_W03]

2. Student knows the principles of environmental engineering related to chemical production and waste management- [K_W08]

3. Has detailed knowledge of technological solutions for environmental protection - [K_W13]

Skills

1. Has the skills to adapt the knowledge of chemistry and electrochemistry to plan and realization of investigation tasks in the field of technologies of environmental protection - [K_U04]

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:

Checking of current knowledge during tautorials.

The knowledge acquired during the tautorials will be verified by a written final test in the subject consisting of 3-7 questions. Passing threshold: 51% of the maximum number of points.

In the case of on-line tautorials, the knowledge check will be carried out in the form of a test consisting of 10 test questions and 10 open questions with 51% passing threshold.

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

In the case of on-line classes, the exam will take the form of a test consisting of 20 test questions and a 5 open questions. Passing threshold: 51% of the maximum number of points.

Programme content

1. Electrochemial technologies used in environmental protection.

2. The processes of electrochemical deposition of metals, technologies of neutralization of waste water containing heavy metals and organic compounds. Electrochemical recovery of heavy metals.

2. Ecological and economical aspects of energetics. The generation, conversion and storage of electrical energy by electrochemical methodes. the application of chemical power sources for the rewersible storage of electrical energy generated from the renewed power sources.

3. Recycling of chemical power sources.

4. Electrochemistry of hydrogen. The application of electrochemically generated hydrogen in power sources, such as fuel cells. wodoru.

5. Electrochemical sensors in methods of wastewater air pollutions treatments.

6. Phenomenon of corrosion, electrochemical corrosion, electrochemistry in protection against corrsion.

Teaching methods

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

Bibliography

Basic

1. T.Stefanowicz, Gospodarka wodno-ściekowa i odpadowa w przemyśle elektrochemicznym, 2001;

2. H. Scholl, T. Błaszczyk, P. Krzyczmonik - Elektrochemia Zarys Teorii i Praktyki, 2007;

3. R. Dylewski, W. Gnot, M. Gnot - Elektrochemia Przemysłowa Wybrane Procesy i Zagadnienia, 1999;

Additional

1. W. M. Lewandowski - Proekologiczne Źródła Energii Odnawialnej, Wyd. Naukowo-Techniczne, Warszawa, 2001;

2. A. Kisza – Elektrochemia: Jonika (cześć I) i Elektrodyka (cześć II), 2000;

3. A. Czerwiński – Akumulatory Baterie Ogniwa, 2005;

4. N.P.Cheremisinoff, Handbook of Water and Wastewater Treatment Technologies, Butterworth-Heinemann, U.S.A. 2002.

5. P. Krawczyk, J.M. Skowroński, 2012, Electrochemical reactivation of expanded graphite electrodes covered by oligomeric products of phenol electrooxidation, Electrochimica Acta, 79, 202-209.

Breakdown of average student's workload

	Hours	ECTS
Total workload	154	7,0
Classes requiring direct contact with the teacher	88	4,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	66	3,0

[1] delete or add other activities as appropriate