COURSE DESCRIPTION CARD - SYLLABUS

Course name

„REDOX OR NON-REDOX… THAT IS THE QUESTION" – TOWARDS UNDERSTANDING ELECTROCHEMISTRY AND ENERGY CONVERSION/STORAGE PROCESSES

Course

Proposed by Discipline
Chemical sciences

Type of studies
Doctoral School

Form of study
full-time

Year/Semester
II/3

Course offered in
English

Requirements
elective

Number of hours

Lecture
8

Tutorials

Projects/seminars

Number of credit points

2

Lecturers

Responsible for the course/lecturer:
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Faculty of Chemical Technology
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Responsible for the course/lecturer:

Prerequisites

Knowledge: Fundamental knowledge on physical chemistry, surface chemistry and double-layer processes.

Skills: Understanding the charge storage processes by principle

Social competencies: Motivation, diligence and self-development attitude

Course objective

The course aims at comprehensive description of modern electrochemical energy conversion and storage systems, with special attention focused on electrochemical capacitors and Li-ion batteries. This should allow for better understanding of charge storage phenomena and appropriate selection of the systems in everydays's life.

Course-related learning outcomes

Knowledge

A PhD student who graduated from doctoral school knows and understands:

1) scientific research methodology in disciplines related to engineering, natural sciences, and social sciences. [P8S_WG/SzD_W03]

Skills

A PhD student who graduated from doctoral school can:

1) critically analyze and asses scientific research results in applied electrochemistry, work of experts and other creative activities together with their contribution into knowledge development, [P8S_UW/SzD_U02]

Social competencies

A PhD student who graduated from doctoral school is ready to:

1) critically analyze and asses scientific research results in physical chemistry and applied electrochemistry, work of experts and other creative activities together with their contribution into knowledge development, [P8S_KK/SzD_K01]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

PQF code	Methods for verification of learning outcomes	Assessment criteria
W03	Final test with 20 closed (20 points) and 5 open (20 points) questions that cover the lecture content.	40-36 points: very good (5.0) 35-30 points: good + (4.5) 28-29 points: good (4.0) 25-27 points: acceptable + (3.5) 21-24 points: acceptable (3.0)
U02		
K01		

Programme content

Lecture will provide the comprehensive knowledge on electrochemical energy storage processes and devices. Special attention will be focused on Li-ion batteries, electrochemical capacitors and various operando methods allowing for full characterization of the materials used in this application.

Course topics

1. Electric double-layer
2. Electrochemical capacitors
3. Li-ion batteries
4. Operando techniques in electrochemistry

Teaching methods

Interactive lecture + active discussion with audience

Bibliography

Basic

(1) Supercapacitors: Materials, Systems, and Applications, Editor(s):Prof. François Béguin, Prof. Elżbieta Frąckowiak, Print ISBN:9783527328833 |Online ISBN:9783527646661 |DOI:10.1002/9783527646661, Copyright © 2013 Wiley-VCH Verlag GmbH & Co. KGaA

Additional

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Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,0
Classes requiring direct contact with the teacher	8	0
Doctoral student's own work (literature studies, preparation for tutorials, project preparation) [1]	42	2,0

[1] delete or add other activities as appropriate