COURSE DESCRIPTION CARD - SYLLABUS

Course name
Electrochemistry [N2Elenerg1-ŹOiME>Ele]

Course

Field of study
Electrical Power Engineering

Year/Semester
1/2

Area of study (specialization)
Renewable Sources and Storage of Energy

Profile of study
general academic

Level of study
second-cycle

Course offered in
polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
10

Laboratory classes
10

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

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Lecturers

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Prerequisites

The student has basic knowledge of chemistry, physics and mathematics acquired in high school and partly from studies in the first year of classes. The student is aware of the limitations of his own knowledge and understands the need for further improvement (further training).

Course objective

The aim of the course is to provide students with knowledge of electrochemical power sources. The lecture will cover the use of galvanic cells such as lithium-ion batteries, nickel-metal hydride batteries, lead-acid batteries, supercapacitors, and others used as energy storage.

Course-related learning outcomes

Knowledge:
1. she or he has knowledge of electrochemical processes, including the appropriate selection of materials, raw materials, methods for the construction of electrochemical energy storage.

2. she or he has knowledge of kinetics, thermodynamics and surface phenomena of electrochemical processes.
3. she or he has knowledge of the latest electrochemical and material technologies used in electrochemical energy storage.

Skills:
1. she or he has the ability to communicate with specialists and non-specialists in the field of electrochemical energy storage.
2. she or he has the ability to analyze and solve problems related to electrochemical energy storage, using theoretical methods for this purpose.
3. she or he is able to critically analyze industrial electrochemical processes in type i and ii cells using the acquired knowledge, including the knowledge of the latest achievements in science and technology.
4. she or he can critically evaluate the practical usefulness of using new developments in electrochemical energy storage.

Social competences:
1. she or he is aware of the need for lifelong learning and professional development.
2. she or he has a developed awareness of the limitations of science and technology related to electrochemical energy storage, including environmental protection.
3. she or he can think and act creatively.
4. she or he understands the need to provide the society with information about the current state and directions of development taking place in electrochemical energy storage and about the risks associated with the acquisition and distribution of raw materials in the cell and battery industry.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
1. Final test.
2. Reports from the realized laboratory exercises.

Programme content

Lecture:
1. The specificity of electrochemical processes. Mechanism and kinetics of electrode processes.
2. Electrochemical energy storage facilities; the principle of operation, structure, construction, operating characteristics.
3. Lithium-ion batteries.
4. Nickel - hydride batteries.
5. Lead-acid batteries.
6. Supercapacitors.
7. Battery management systems (BMS).
Laboratory classes:
Classes discussing the regulations of the laboratory, topics of laboratory classes and OHS training related to the operation of laboratory positions. To perform 6 two-hour laboratory classes in the field of lecture.

Teaching methods

Lecture with multimedia presentation supplemented with examples given on the board.
Laboratory classes - object-orientedpresentations supported by illustrated examples presented on the board, presentations of selected experiments, initiating teamwork.

Bibliography

Basic
1. A. Czerwiński, Akumulatory, bateria, ogniwa, WKŁ, Warszawa 2005.
2. M. Świerżewski,Chemiczne źródła prądu elektrycznego, Wydawnictwo SEP COSIW 2013.
Additional
1. A. Ciszewski, Podstawy inżynierii elektrochemicznej, Wydawnictwo Politechniki Poznańskiej, Poznań 2004.
2. C.H. Hamann, A. Hamnett, W. Vielstich, Electrochemistry, WILEY-VCH Verlag GmbH & Co. KGaA,

Weinheimn 2007.
3. C. Lefrou, P. Fabry, J.-C. Poignet, Electrochemistry: The Basics, With Examples, Springer, 2012.

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,00
Classes requiring direct contact with the teacher	20	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00