COURSE DESCRIPTION CARD - SYLLABUS

Course name
Biomaterials in electrochemistry [S2IChiP1-IBiB>BwE]

Course

Field of study
Chemical and Process Engineering

Year/Semester
1/1

Area of study (specialization)
Bioprocesses and Biomaterials Engineering

Profile of study
general academic

Level of study
second-cycle

Course offered in
polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
30

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

5,00

Coordinators

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Lecturers

Prerequisites

The student has a basic knowledge of chemistry, physics and mathematics acquired from the first degree of study in the fields of chemical technology, environmental protection technologies, chemical and process engineering, pharmaceutical engineering or other related fields. The student has mastered the ability to independently perform laboratory experiments in the field of inorganic, organic, physical, analytical chemistry, chemical technology and chemical engineering. The student is aware of the limitations of their own knowledge and understands the need for further improvement (further training).

Course objective

To acquaint student with the theoretical aspects of electrodeposition and current trends of electroplating technology, economic aspects of metal deposition as well as current legal regulations. The course is focused on the management and technological processes in electrocoating plants.

Course-related learning outcomes

Knowledge:
1. has extended and deepened knowledge in the field of chemistry and other related areas of science, allowing for the formulation and solution of complex tasks related to chemical engineering. [k_w03]

2. he has established knowledge in the field of process safety and occupational health. [k_w11]
3. has well-established and expanded knowledge of the selected specialization. [k_w12]
4. knows and understands to an in-depth degree - selected facts and phenomena as well as the methods and theories related to them explaining the complex relationships between them, constituting advanced general knowledge in the field of the scientific discipline, forming the theoretical basis, structured and theoretically founded knowledge covering key issues and selected issues in the field of advanced detailed knowledge and practical application of this knowledge in professional activities related to their direction, as well as the main development trends. [k_w01-09 k_w12]

Skills:
1. has the ability to obtain and critically evaluate information from literature, databases and other sources, and to formulate opinions and reports on this basis. [k_u01]
2. has the ability to work in a team and to lead a team. [k_u02]
3. he can plan and carry out experiments, including measurements and computer simulations, interpret the obtained results and draw conclusions. [k_u07,k_u09, k_u18, k_u19]
4. has the ability to communicate with specialists and non-specialists in the field of chemical technology and related fields. [k_u04]
5. can independently determine the directions of further education and pursue self-education. [k_u05]
6. has the ability to present research results in the form of a report, dissertation or presentation. [k_u06]
7. can critically evaluate the results of experimental research and determine the direction of further research leading to solving problems in the field of chemical engineering, process apparatus and industrial technologies. [k_u18]
8. has the ability to use the knowledge acquired as part of the specialization in professional activity. [k_u20]
9. he can use his knowledge - formulate and solve complex and unusual problems and perform tasks in conditions not fully predictable by:
- proper selection of sources and information derived from them, evaluation, critical analysis and synthesis of this information,
- selection and application of appropriate methods and tools, including advanced information and communication techniques
- adaptation of existing or development of new methods and tools to use the existing knowledge
- formulate and solve problems and perform tasks typical for professional activity
- formulate and test hypotheses related to simple research problems. [k_u01, k_u06-14, k_u17-20]

Social competences:
1. can interact and work in a group, assuming different roles in it. [k_k03]
2. is able to properly define priorities for the implementation of a task set by himself or others. [k_k04]
3. can think and act creatively and enterprisingly. [k_k06]
4. is ready to critically evaluate his knowledge and received content. the graduate is ready to recognize the importance of knowledge in solving cognitive and practical problems and to consult experts in the case of difficulties in solving the problem on their own. [k_k01, k_k04, k_k05]
5. is aware of the importance and understands the non-technical aspects and effects of engineering activities, including its impact on the environment and the related responsibility for decisions made. [k_k02]
6. is ready to fulfill professional roles responsibly, taking into account the changing social needs, including:
- developing professional achievements,
- maintaining the ethos of the profession,
- observing and developing the principles of professional ethics and acting towards the observance of these principles. [k_k01, k_k07]

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. Ongoing control of knowledge and skills during laboratory exercises.
2. Assessment of the oral and written answers on the issues related to laboratory exercises.
3. Written final exam in stationary conditions or an exam in a remote form using the e-learning platforms of the Poznań University of Technology.

Programme content

1. Introduction to the subject "Biomaterials in electrochemistry"
2. The specificity of electrochemical processes.
3. Mechanism and kinetics of electrode processes.
4. The role of mass transport in electrode processes.
5. Corrosion processes in biological systems.
6. Biomaterials in corrosion protection.
7. Engineering solutions in the implementation of the principle of best use of biomaterials in electrochemical industrial processes.
8. The use of biomaterials in chemical power sources.

Teaching methods

1. Supply methods (lectures).
2. Practical methods (laboratory exercises).

Bibliography

Basic
1. A. Ciszewski, Podstawy inżynierii elektrochemicznej, Wydawnictwo Politechniki Poznańskiej, Poznań 2004.
2. A. Ciszewski, Wybrane zagadnienia inżynierii elektrochemicznej, Wydawnictwo Politechniki Poznańskiej, Poznań 2011.
Additional
3. A. Czerwiński, Akumulatory, bateria, ogniwa, WKŁ, Warszawa 2005.
4. H. Sholl, T. Błaszczyk, P. Krzyczmonik, Elektrochemia. Zarys teorii i praktyki, Wydawnictwo Uniwersytetu Łódzkiego, Łódź 1998.
5. A. Kisza, Elektrochemia. Tom I: Jonika, WNT, Warszawa 2000.
6. A. Kisza, Elektrochemia. Tom II: Elektrodyka, WNT, Warszawa 2000.
7. H. Bala, Korozja materiałów – teoria i praktyka, WIPMiFS, Częstochowa 2000.
8. J. Wojciechowski, K. Szubert, R. Peipmann, M. Fritz, U. Schmidt, A. Bund, G. Lota, Electrochim. Acta 220, 2016, 1-10.

Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5,00
Classes requiring direct contact with the teacher	60	2,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	65	2,50