

A. Ogólny opis przedmiotu

Nazwa pola	Komentarz
Name of the subject (in Polish and English)	Applied electrochemistry (elektrochemia stosowana)
Unit offering the subject	Faculty of Chemistry
Unit for which the subject is offered	Faculty of chemistry
Subject code	0600-S1-SP/W-AE
ISCED code	0531
Number of ECTS credits	2
Method of assessment	essay
Language of instruction	English
Designation whether a subject may be credited more than once	no
Allocation of the subject to subject groups	facultative subject
Total student workload	Contact hours with teacher: 40 hrs - participation in lectures - 10 hrs - participation in lab courses - 20 hrs - consultations - 10 hrs Self-study hours: 25 - preparation for lectures - 5hrs - reading literature- 5 hrs - preparation for lab and data analysis- 5 hrs - preparation for examination- 10 hrs Altogether: 5 hrs (2 ECTS)
Learning outcomes - knowledge	W1: student has advanced knowledge of electrical conductivity in condensed matter; W2: student is familiar with conducting polymers and their basic properties. W3: student possesses knowledge of corrosion processes in metals W4: student is familiar with application of conducting polymers in corrosion protection. W5: student has advanced knowledge of chemical sources of electric current; W6: student is familiar with classification of galvanic cells; W7: student possesses knowledge of electrode reactions and calculation of electromotive force of a given red-ox system; W8: student is acquainted with construction and functions of fuel cells. W1-W8: K_W01: zna podstawy chemii ogólnej, fizycznej, organicznej i analitycznej
Learning outcomes - skills	U1: student can analyse the current-voltage characteristics of ohmic material; U2: student can explain the temperature dependence of electric conductivity of given material; U3: student is able to manufacture simple aluminium-air cell and determine its voltage characteristics; U4: student can perform the measurements of Tafel characteristics of given electrode system. U1-U4: K_U03: posiada umiejętności wykonywania pomiarów podstawowych wielkości chemicznych oraz potrafi opracować wyniki eksperymentów chemicznych
Learning outcomes - social competencies	K1: - Graduate is able to efficiently organize efficiently work in laboratory K2: Graduate is able to recognize the problem and solve it K3: Graduate can properly formulate conclusions based on laboratory observations K4: Graduate is able to successfully and systematically conduct laboratory experiments

	K5: Graduate is able to cooperate in with other persons and work in a team K1-K4: K_K01: samodzielnie i efektywnie pracuje z dużą ilością informacji, dostrzega zależności i poprawnie wyciąga wnioski posługując się zasadami logiki
Teaching methods	- informative lecture - laboratory exercises
Prerequisites	“none”
Brief description of the subject	The subject concern selected topics of applied electrochemistry including conducting polymer characterization. During the lectures students have opportunity to understand important aspect concerning chemical power sources. They are given a review of new electroactive materials and impact the electrochemistry make on human society. Corresponding laboratory course will cover manual practice of measurements of selected properties of polymers, including electrical properties.
Complete description of the subject	During the course of lectures students will be introduced to selected topics of electrochemistry. There will be discussed basics of electronic conduction in condensed matter. conducting polymers and their application will be described to picturize the recent application of applied electrochemistry of new materials. The topics related to electrochemical corrosion of metals are introduced to give an insight to the application of conducting polymers as anti-corrosion protection agents and explain the specific properties of conducting polymers. Further discussion will be directed to chemical sources of electricity as environmentally friendly power generation methods. The thermodynamic characterization and general classification of galvanic cells will be provided. The lecture will also cover the application of conducting polymers in chemical sources of current. Laboratory course will be complementary to the lecture and will concern several exercises related to investigation of electronic properties of conducting polymers, electrochemistry,
Literature	1. S. Glasstone, An Introduction to Electrochemistry; Maurice Press, London (April 16, 2013) 2. Mary D. Archer, Arthur J. Nozik; Nanostructured and photoelectrochemical systems for solar photon conversion; Series on Photoconversion of Solar Energy – vol. 3; Imperial College Press, Cambridge 2008. 3. J. Koryta, J. Dvorask, V. Bohackova Electrochemistry. Methuen, London 1970. 4. V. S. Bagotsky, Fundamentals of Electrochemistry, Second Edition John Wiley & Sons, Weinheim 2005 (DOI:10.1002/047174199X). 5. C. H. Hamann, A. Hammett, W. Vielstich, Electrochemistry, WILEY-VCH, Weinheim 2007.
Assessment methods & criteria	Assessment methods: - written essay: W1-W8 - activity: U1-U10, K1-K5 Assessment criteria: fail- below 50 pts (50%) satisfactory- 50-60 pts (50-60%) satisfactory plus- 61-65 pts (61-65%) good – 66-75 pts (66-75%) good plus- 76-80 pts (76-80%) very good- 81-100 pts (81-100%)
Work placement	„not applicable”

B) Opis przedmiotu cyklu

Nazwa pola	Komentarz
Didactic cycle	(summer)
Method of assessment of the subject in the cycle	As in part A

Type of classes, number of hours of classes and methods of assessment	lectures - 10 hrs, essay lab oratory - 20 hrs, essay
Subject coordinator	Dr hab. Jacek Nowaczyk
Subject teachers	Dr hab. Jacek Nowaczyk
Nature of the subject	facultative subject
Limit of places available in each group	Lecture – 1 group Laboratory 1 group – up to 8 students
Time and place	Faculty of Chemistry, date will be specified later
Number of hours using distance learning methods and techniques	-
Subject website	-
Learning outcomes	If identical with part A please write „As in part A”
Assessment methods & criteria	If identical with part A please write „As in part A”
List of topics	LECTURE 1. Basic concept of electronic conduction in condensed matter 2. Conducting polymers and their application 3. Application of conducting polymer for corrosion protection of metals 4. Chemical sources of electricity 5. Recent trends in chemical sources of electricity LABORATORY 1. Measurements of current-voltage characteristics of conducting polymers 2. Analysis of temperature dependence of specific conductivity of materials 3. Preparation and physicochemical characterization of aluminum - air battery. 4. Measurements of Tafel equation parameters for given electrode system.
Teaching methods	If identical with part A please write „As in part A”
Literature	If identical with part A please write „As in part A”