COURSE UNIT (MODULE) DESCRIPTION

Course unit (module) title	Code
Electrochemistry	

Academic staff	Core academic unit(s)
Coordinating: **Prof. habil. dr. Arūnas Ramanavičius** **Other:**	**Faculty Chemistry and Geosciences** **Dept. Physical Chemistry, Vilnius University**

Study cycle	Type of the course unit
Second	Compulsory

Mode of delivery	Semester or period when it is delivered	Language of instruction
Contact or Remote Face to face Lectures	3st semester	English

Requisites	
Prerequisites: Backgrounds in Physical chemistry	**Co-requisites (if relevant):** Backgrounds in Analytical chemistry

Number of ECTS credits allocated	Student's workload (total)	Contact hours	Individual work
5	125	64	61

Purpose of the course unit

A.1. The ability to characterize electrochemical systems.

A.2. The ability to determine properties and characteristics of electrochemical systems.

A.3. The ability to explain electrochemical characteristics of systems, taking into account the kinetics of electrochemical, chemical and other physicochemical processes.

B.1. The ability to apply knowledge and suitable methods in practical application of electrochemical chemical kinetics.

B.3. The ability to compare various methods of electrochemical synthesis and deposition of various materials.

C.1. The ability to plan and conduct research in the field of electrochemistry.

C.2. The ability to analyze, make generalizations and critically evaluate practical information related to kinetics of chemical and physical processes.

D.2. The readiness to study continuously and autonomously, ability to evaluate critically the novelties in the field of electrochemistry, physical chemistry and related sciences, the ability to improve and update knowledge and skills and to seek new ones.

D.3. The ability to present clearly and scientifically knowledge and concepts of electrochemistry and electrochemical chemical kinetics to the professionals and non-professionals.

Learning outcomes of the course unit	Teaching and learning methods	Assessment methods
Understand principles of development of electrochemical systems	Lectures, consultations, seminars	Mid-term examination, final exam.

Apply kinetic and some other physicochemical analysis methods	Lectures, consultations, seminars	Mid-term examination, final exam.
Explain mechanisms of electrochemical reactions in different solutions	Lectures, consultations, seminars	Mid-term examination, final exam.
Evaluate influence of oxidation/reduction and diffusion to the velocity of chemical/biochemical reactions	Lectures, consultations, seminars	Mid-term examination, final exam.
To evaluate kinetics of electrochemical reactions.	Lectures, consultations, seminars	Mid-term examination, final exam.

Content	**Contact hours**							**Individual work: time and assignments**	
	Lectures	Tutorials	Seminars	Workshops	Laboratory work	Internship	**Contact hours, total**	**Individual work**	**Tasks for individual work**
1. Introduction. Aims.	1		1				**2**	**1**	**2**
2. Main methods used for the description of electrochemical systems.	2		2				**4**	**1**	**2**
3. Galvanic and electrolysis cells, main principles and differences.	4		4				**8**	**2**	**2**
4. Description of electrochemical reactions.	2		2				**4**	**2**	**2**
5. Thermodynamics of electrochemical reactions.	3		3				**6**	**2**	**2**
6. Nernst equation.	3		3				**6**	**2**	**2**
7. Heterogenic processes in electrochemical reactions.	3		3				**6**	**2**	**2**
8. Some kinetics aspects in electrochemical reactions. Principles and application of electrochemical kinetics and kinetics-based methods.	3		3				**6**	**2**	**2**
9. Fuel, biofuel cells and other types of chemical reactions.	3		3				**6**	**3**	**2**
10. Photo electrochemistry.	3		3				**6**	**3**	**2**
11. Analytical electrochemistry.	3		3				**6**	**3**	**2**
12. Bioelectrochemistry	2		2				**4**	**2**	**2**
Preparation of oral presentation.								**18**	
Preparation for the exam and defence of the exam.								**18**	
Total	**32**		**32**				**64**	**61**	**24**

Assessment strategy	Weight %	Deadline	Assessment criteria
Oral presentation	20	During the semester	Oral presentation with slides.
Seminars	40	During the semester	Solving of numerical problems
Exams	40	During the semester	Answers in written form

Author	Year of publication	Title	Issue of a periodical or volume of a publication	Publishing place and house or web link
Compulsory reading				
Atkins P., Paula J.	2006	Physical Chemistry, 8th Ed., ,.	Oxford University Press	VU Library
Bard A.J., Faulkner L.R.	2001	Electrochemical methods. Fundamentals and applications (2ed., ,)	John Wiley & sons, inc.	VU Library
J.O'M Bockris, A.K.N.Reddy.	1998	Modern Electrochemistry	Plenum Press, New York	VU Library
Optional reading				
K.J. Vetter,	1967	Electrochemical Kinetics, ,	New York, Academic Press	VU Library
R. A. Alberty, F. Daniels	1978	Physical Chemistry,	John Wiley and Sons	VU Library