COURSE UNIT (MODULE) DESCRIPTION

Course unit (module) title	Code
Analytical Chemistry	

Lecturer(s)	Department(s) where the course unit (module) is delivered
Coordinator: Prof. Vida Vičkačkaitė **Other(s):**	Faculty of Chemistry and Geosciences, Department of Analytical and Environmental Chemistry, Naugarduko 24, 03225 Vilnius

Study cycle	Type of the course unit (module)
Bachelor	Elective

Mode of delivery	Period when the course unit (module) is delivered	Language(s) of instruction
Face-to-face	Spring semester	English

Requirements for students	
Prerequisites: General Chemistry	**Additional requirements (if any):**

Course (module) volume in credits	Total student's workload	Contact hours	Self-study hours
5	80	32	48

Purpose of the course unit (module): programme competences to be developed		
To develop students ability to think abstractly and to work autonomously, to analyze and synthesize information, to apply the obtained knowledge for problems solving.		
Learning outcomes of the course unit (module)	**Teaching and learning methods**	**Assessment methods**
Students will be able: - to work autonomously	Self-study	Written colloquium
- to analyze and synthesize data;	Lectures, self-study	Problem-solving exercises, written colloquium
- to understand and explain the principles of main analytical methods;	Lectures, self-study	Written colloquium
- to calculate solubility of compounds;	Lectures, self-study	Problem-solving exercises, written colloquium
- to calculate pH of acids, basis and buffer solutions;	Lectures, self-study	Problem-solving exercises, written colloquium

Content: breakdown of the topics	Contact hours							Self-study work: time and assignments	
	Lectures	Tutorials	Seminars	Exercises	Laboratory work	Internship/work placement	**Contact hours**	**Self-study hours**	**Assignments**
1. Solutions, their concentrations.	1		1				**2**	**3**	Textbook reading, problem solving
2. Steps and methods of chemical	1		1				**2**	**3**	Textbook reading

analysis. Qualitative and quantitative chemical analysis.									
3. Errors in chemical analysis.	1		1				**2**	**3**	Textbook reading, problem solving
4. Precipitation equilibrium, solubility-product constant, solubility calculations, effect of common ion, ionic strength, complex formation and strong acids on solubility. Formation of crystalline and colloidal precipitates, co-precipitation.	2		2				**4**	**6**	Textbook reading, problem solving
5. Gravimetric analysis, Precipitates and precipitating reagents. Calculation of results from gravimetric data.	1		1				**2**	**3**	Textbook reading, problem solving
6. Precipitation titration, indicators, titration curves, applications.	1		1				**2**	**3**	Textbook reading, problem solving
7. Acids and bases in aqueous solutions, concepts, conjugate acid/base pair, strengths of acids and bases, dissociation constants, pH, buffer solutions and buffer capacity.	3		3				**6**	**9**	Textbook reading, problem solving
8. Acid-base titration, pH indicators, titration curves, application areas.	1		1				**2**	**3**	Textbook reading, problem solving
9. Oxidation/reduction equilibrium, galvanic cell, electrode potentials, Nernst equation, calculation of electrode potentials.	2		2				**4**	**6**	Textbook reading, problem solving
10. Oxidation/reduction titration, indicators, titration curves, titration modes, application.	1		1				**2**	**3**	Textbook reading, problem solving
11. Complex-formation reactions and equilibrium constants, ligand types.	1		1				**2**	**3**	Textbook reading, problem solving
12. Titration with monodentatic ligands. Complexonometric titration, EDTA, titration curves, indicators and applications.	1		1				**2**	**3**	Textbook reading, problem solving
Total	**16**		**16**				**32**	**48**	

Assessment strategy	**Weight, %**	**Deadline**	**Assessment criteria**
Written colloquium (1-6 topics)	50	15 of April	90-100 % of task accomplished – 10. 80-89 % of task accomplished – 9. 70-79 % of task accomplished – 8. 60-69 % of task accomplished – 7. 50-59 % of task accomplished – 6. 40-49 % of task accomplished – 5. Less than 40 % of task accomplished – unsatisfactory.
Written colloquium (7-12 topics)	50	30 of June	90-100 % of task accomplished – 10. 80-89 % of task accomplished – 9. 70-79 % of task accomplished – 8. 60-69 % of task accomplished – 7. 50-59 % of task accomplished – 6. 40-49 % of task accomplished – 5. Less than 40 % of task accomplished – unsatisfactory.

Author	**Year of publication**	**Title**	**Issue of a periodical or volume of a publication**	**Publishing place and house or web link**
Compulsary reading				
D. A. Skoog, D.M. West,	1998	Fundamentals of Analytical		Saunders College Publishing

F.J. Holler		Chemistry (7th edition).		
D. A. Skoog, D.M. West, F.J. Holler, S.R. Crouch	2004	Fundamentals of Analytical Chemistry		Thomson Books/Cole
R.A.Day, I.R., A.L. Underwood	1991	Quantitative analysis (sixth edition)		Englewood Cliffs
Optional reading				
Edited by R. Kellner, J.M. Mermet, M. Otto, H.M. Widmer	1998	Analytical Chemistry		Wiley-VCH