COURSE UNIT (MODULE) DESCRIPTION

Course unit (module) title	Code
Hydrosphere cycles and zonalities investigation	HGBBP711

Lecturer(s)	Department(s) where the course unit (module) is delivered
Coordinator: Žana Skuratovič **Other(s):**	Faculty of Chemistry and Geosciences, Vilnius University Institute of Geosciences Department of Hydrogeology and Engineering Geology

Study cycle	Type of the course unit (module)
Second	Compulsory

Mode of delivery	Period when the course unit (module) is delivered	Language(s) of instruction
Face-to-face and distance learning	I semester	Lithuanian

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

Course (module) volume in credits	Total student's workload	Contact hours	Self-study hours
5	133	64	69

Purpose of the course unit (module): programme competences to be developed

Ability to understand structure and properties of the hydrosphere; ability to understand the principles and ways of their identification, evolution.

Learning outcomes of the course unit (module)	Teaching and learning methods	Assessment methods
- Will be able to describe hydrosphere components properly, using specific terminology and measurement units. - Will be able to explain the properties and structure of the hydrosphere, processes the mechanisms and evolution. - Will be able to understand the features of hydrochemical - isotopic formation of water systems; interaction between natural and anthropogenic processes.	Lectures Individual work	Exercise tasks Colloquium Written and oral examination

Content: breakdown of the topics	Contact hours	Self-study work: time and assignments

	Lectures	Tutorials	Seminars	Exercises	Laboratory work	Internship/work	**Contact hours**	**Self-study hours**	**Assignments**
1. Introduction. Hydrosphere and cycle formation processes. (Water circuits: precipitation, evaporation-condensation, surface water, soil moisture, groundwater).	4						4	4	Literature studies
2. Vertical and lateral zonality of natural water; the balance of natural water: atmosphere, ocean, continental surface water, groundwater. Quantitative and qualitative indicators and seasonal variations. The principles of groundwater and meteoric water mixing.	8						8	8	Literature studies Preparing for Exercise
3. The studies of the of the hydrosphere water composition using Hydrochemical-isotopic methods.	8						8	8	Literature studies Preparing for Exercise
4. Processes and environmental factors influencing the formation of chemical and isotopic composition of water. Exercise.	8		4				12	13	Literature studies Preparing for Exercise
5. Hydrochemical-Isotopic Tracers Research Methods. Isotopes in geosciences research: outline of isotopic research history, definitions, stable isotope standards and measurements, radioactive isotopes. Exercise.	12		8				20	2 2	Literature studies Preparing for Exercise
6. Hydrochemical-isotopic zonality and anomalies of the Baltic Artesian Basin. Exercise	8		4				12	14	Literature studies Preparing for Exercise
Total	**48**		**16**				**64**	**69**	

Assessment strategy	**Weight ,%**	**Deadline**	**Assessment criteria**
Colloquium	30	Mid-semester, after 3 topic	Written and oral answers to three equal weight questions. 3 points. Excellent knowledge and skills. Responds to three equal weight issues. 2 points. Knowledge and skills meet minimum requirements. Responds to key questions. 1 point. Knowledge and skills still meet minimum requirements. Incomplete response to key questions. 0 points. Not satisfying the minimum requirements.
Exercise	20	During the semester	2 points. Carefully perform the exercise works. Responds to all questions. Formulates problems and challenges. 1 point. The work contains minor fixes for errors. Answers to some questions. 0 points. Not satisfying the minimum requirements.
Examination	50	During the session	Written answers to three equal weight questions. Orally answers additional questions. 5 points. Excellent knowledge and skills. 4 points. Good knowledge and skills, may be minor mistakes. 3 points. Average knowledge and skills, there are mistakes. 2 points. Knowledge and skills are below average are fundamental mistakes.

			1 point. Knowledge and skills still meet minimum requirements. 0 points. Not satisfying the minimum requirements.

Author	Year of publication	Title	Issue of a periodical or volume of a publication	Publishing place and house or web link
Compulsary reading				
Clark I. D., Fritz P	1997	Environmental Isotopes in Hydrogeology		Lewis Publishers, 328 p.
Mokrik R., Mažeika J	2006	Hidrogeochemija. Vadovėlis aukštosioms mokykloms.		Vilniaus, VUL, 244 p.
Optional reading				
Mokrik R.	2003	Baltijos baseino paleohidrogeologija. Neoproterozojus ir Fanerozojus.		Vilniaus, VUL, 332 p.
Juodkazis V., Mažeika J., Petrošius R.	1995	Radioizotopiniai metodai ekologinėje hidrogeologijoje.		Geologija. Nr. 18, 132 p.