



COURSE UNIT (MODULE) DESCRIPTION

Course unit (module) title	Code
Hydrosphere Cycles and Zonalities Investigation	HGBBP711

Academic staff	Core academic unit(s)
Coordinating: Assoc. prof. dr. Vytautas Samalavičius Other:	Chemijos ir geomokslų fakultetas, Geomokslų institutas Čiurlionio 21/27, Vilnius

Study cycle	Type of the course unit
Second	Compulsory

Mode of delivery	Semester or period when it is delivered	Language of instruction
Face-to-face and distance learning	I semester	English

Requisites	
Prerequisites: Hydrogeology	Co-requisites (if relevant):

Number of ECTS credits allocated	Student's workload (total)	Contact hours	Individual work
5	133	64	69

Purpose of the course unit
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	Teaching and learning methods	Assessment methods
- Will be able to describe hydrosphere components properly, using specific terminology and measurement units.	Lectures, informatios search, literature study	Test, presentation, Colloquium Written examination, preparing presentation
- Will be able to explain the properties and structure of the hydrosphere, processes the mechanisms and evolution.	Lectures, informatios search, reading literature, tests	Test, preparing presentation, Colloquium Written examination
- Will be able to understand the features of hydrochemical - isotopic formation of water systems; interaction between natural and anthropogenic processes. - Will be able to make conclusions.	Searching for information, reading literature, lecture, test, preparing a presentation,	Test, preparing presentation, Colloquium Written examination

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. Hydrosphere and cycle formation processes. Water circuits: precipitation, evaporation-condensation, surface water, soil moisture, groundwater.	6								Literature studies: Mokrik R., Mažeika J., 2006. Hidrogeochemija, 7-14; Willem G. Mook., 2001, Environmental isotopes in the hydrological cycle. Principles and Applications, Vol. I. 1–16.
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.	6		4						Literature studies: Mokrik R., Mažeika J., 2006. Hidrogeochemija, 194-217; Amore, F. D', Darling G., Paces T., Pang Z., Šilar J., Environmental isotopes in the hydrological cycle. Principles and Applications, 333–358.
3. Hydrochemical-Isotopic Tracers Research Methods. Isotopes in geosciences research: outline of isotopic research history, definitions, stable isotope standards and measurements, radioactive isotopes.	8		4						Literature studies: Mokrik R., Mažeika J., 2006. Hidrogeochemija, 157-178; Amore, F. D', Darling G., Paces T., Pang Z., Šilar J., Environmental isotopes in the hydrological cycle. Principles and Applications IV, 358–389. Willem G. Mook., 2001, Environmental isotopes in the hydrological cycle. Principles and Applications, Vol. I. 389–405.
4. Hydrochemical-isotopic studies of Hydrosphere water composition. Processes and environmental factors influencing the formation of chemical and isotopic composition of water.	10		4						Literature studies Mokrik R., Mažeika J., 2006. Hidrogeochemija, 217;

									Amore, F. D', Darling G., Paces T., Pang Z., Šilar J., Environmental isotopes in the hydrological cycle. Principles and Applications, 389–405. Willem G. Mook., 2001, Environmental isotopes in the hydrological cycle. Principles and Applications, Vol. I. 49–53; 75–84.
5. Hydrochemical-isotopic zonality and anomalies of the Baltic Artesian Basin. Exercise	10		4						Literature studies: Mokrik R., 2003, Baltijos baseino paleohidrogeologija. Neoproterozojus ir Fanerozojus, 8-49.
Preparation to pass the exam		4							
Total	44	4	16					64	69

Assessment strategy	Weight %	Deadline	Assessment criteria
Exam (written): a 20-question closed-ended test	100	During the session	Every 2 correct answers equal 1 point. If the number of correct answers is odd, it is rounded up to the next point in the student's favor.

Author (-s)	Publishing year	Title	Issue of a periodical or volume of a publication	Publishing house or web link
Required reading				
F.D'Amore, G.Darling, T.Paces, Z.Pang, J.Šilar	2000	Environmental isotopes in the hydrological cycle. Principles and Applications, Vol. IV.		International atomic energy agency and united Nations educational, scientific and cultural organization, 317–409 pp.
Willem G. Mook	2001	Environmental isotopes in the hydrological cycle. Principles and Applications, Vol. I.		International atomic energy agency and united Nations educational, scientific and cultural organization, 1-541 pp
Recommended reading				
Mokrik R.	2003	Baltijos baseino paleohidrogeologija. Neoproterozojus ir Fanerozojus.		Vilniaus, VUL, 332 p.
Mokrik R., Mažeika J	2006	Hidrogeochemija. Vadovėlis aukštosios mokykloms.		Vilniaus, VUL, 244 p.