



### COURSE UNIT (MODULE) DESCRIPTION

Course unit (module) title	Code
<b>Water management</b>	

Lecturer(s)	Department(s) where the course unit (module) is delivered
<b>Coordinator: Edvinas Stonevičius</b> <b>Other(s):</b>	Faculty of Chemistry and Geosciences, Institute of Geosciences M.K Čiurlionio st. 21/27, LT- 03101 Vilnius

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
Remote	autumn	English

Requirements for students	
<b>Prerequisites:</b> none	<b>Additional requirements (if any):</b> none

Course (module) volume in credits	Total student's workload	Contact hours	Self-study hours
<b>5</b>	<b>134</b>	<b>32</b>	<b>102</b>

Purpose of the course unit (module): programme competences to be developed		
After completing the course, students will be able to understand the complicity and interdisciplinary nature of water management and will be able to manage water resources and water related risks.		
Learning outcomes of the course unit (module)	Teaching and learning methods	Assessment methods
Will be able to understand the links between nature, economy, society, legislation and water management.	Lectures, seminars, exercises self-study	Exam
Will be able to propose wide spectrum of water management measures and to evaluate their feasibility.	Lectures, seminars, exercises self-study	Exam
Will be able to understand the global water management approaches and need for planning in water management. Will be able to participate or initiate the process.	Lectures, seminars, exercises self-study	Exam
Will be able familiar with EU regulation of water management.	Lectures, seminars, exercises self-study	Exam, seminar.
Will be able to evaluate risk of hydrometeorological hazards and propose solutions to manage risk.	Lectures, seminars, exercises self-study	Exam, seminar.

Content: breakdown of the topics	Contact hours					Total contact hours	Self-study hours	Self-study work: time and assignments
	Lectures	Seminars	Exercises	Laboratory work	Internship/work placement			Assignments
<b>1. Water management and its objective</b> Definition of water management. Water management an interdisciplinary science. Water as part of environment and as a resource. Water resources, they distribution and dynamics. Main water management challenges and their examples	2					2	4	Reading and analysis of textbooks and scientific papers, exercises.
<b>2. Water management measures</b> Classification of water management measures. Structural and non-structural measures. Nature based measures. Measures to manage water scarcity. Measures to manage floods. Measures to manage water quality.	2	4				6	20	Reading and analysis of textbooks and scientific papers.
<b>3. Water management approaches</b> Integrated water resources management and its principles. Water, Food and Energy NEXUS, Sustainable Development Goals	4	4				8	20	Reading and analysis of textbooks and scientific papers.
<b>4. Regulation of water management</b> EU water framework directive. River basin management. Ecological and chemical status of water bodies. EU flood directive.	4	4				8	20	Reading and analysis of textbooks and scientific papers, exercises, preparation for seminar.
<b>5. Management of hazard and risk</b> The hazard, risk, sensitivity, exposure and adaptation in risk management. Quantitative and qualitative methodology of hazard and risk estimation. Vulnerability functions.	4	4				8	20	Reading and analysis of textbooks and scientific papers, exercises, preparation for seminar.
<b>6. Preparation for exam</b>							18	Reading and analysis of textbooks and lecture material
<b>Total</b>	16	16				32	102	

Assessment strategy	Weight,%	Deadline	Assessment criteria
Students prepare a presentation on agreed topic and give a presentation for class	20	During the semester	Maximum 2 point for each presentation and assignment. 2 point. The presentation is high quality and comprehensive. Student clearly knows assigned topic. Can answer questions from audience and participate in discussion. 1 point. The presentation is superficial or not well prepared or student not fully knows assigned topic. 0 points. Presentation is not prepared or is low quality.

Group assignment. Students put combined effort in creatively solving of agreed practical tasks.	20	During the semester	<p>Maximum 2 point for assignment.</p> <p>2 point. The results and their presentation are high quality and comprehensive. Student clearly knows assigned topic. Can answer questions from audience and participate in discussion. Student was adequately involved in the completion of the task.</p> <p>1 point. The results and their presentation is superficial or not well prepared or student not fully involved in the completion of the task.</p> <p>0 points. Student has not participated in the completion of assignment.</p>
Participation and initiation of discussions.	30	During the semester	<p>Learning material is given for students before seminars. Students have to read it and be ready to participate in discussions on proposed topic. During each seminar, the knowledge of material is evaluated from 0 to 1 points. For each active participation or initiation of discussion students are rewarded 0.2 points. The points for discussions accumulate during semester to 2 point maximum. The final sum of points (max 3) is the mean of points for material knowledge (max 1 point) plus accumulated points for participation in discussions (max 2 points)</p>
Exam	30	During the session	<p>Only students who complete all the tasks during semester can attend exam.</p> <p>Exam consists of 3 open questions. The maximum for each question is 5 points.</p> <p>5 points. Answer is correct and comprehensive.</p> <p>4 points. Answer is correct but not completely comprehensive.</p> <p>3 points. Answer is correct but not comprehensive.</p> <p>2 points. Answer is more correct than incorrect.</p> <p>1 point. Answer is only partly correct.</p> <p>0 points. Question not answered or answer is incorrect.</p> <p>Total grade for the exam is an average of points scored for answers.</p>

Author	Year of publication	Title	Issue of a periodical or volume of a publication	Publishing place and house or web link
<b>Compulsory reading</b>				
D.P. Loucks, E. van Beek.	2005	Water Resources Systems Planning and Management: An Introduction to Methods, Models & Applications,		UNESCO Publ. <a href="http://unesdoc.unesco.org/images/0014/001434/14340e.pdf">http://unesdoc.unesco.org/images/0014/001434/14340e.pdf</a>
Global Water Partnership (GWP) and the International Network of Basin Organizations (INBO)	2009	A Handbook for Integrated Water Resources Management in Basins		<a href="https://www.gwp.org/globalassets/global/toolbox/references/a-handbook-for-integrated-water-resources-management-in-basins-inbo-gwp-2009-english.pdf">https://www.gwp.org/globalassets/global/toolbox/references/a-handbook-for-integrated-water-resources-management-in-basins-inbo-gwp-2009-english.pdf</a>
Hoff, H (ed.)	2011	Understanding the Nexus Background paper for the Bonn2011 Nexus Conference		<a href="https://www.sei.org/media-manager/documents/Publications/SEI-Paper-Hoff-UnderstandingTheNexus-2011.pdf">https://www.sei.org/media-manager/documents/Publications/SEI-Paper-Hoff-UnderstandingTheNexus-2011.pdf</a>
United Nations	2018	The Sustainable Development Goal 6 Synthesis Report 2018 on Water and Sanitation		<a href="http://www.unwater.org/app/uploads/2018/12/SDG6_SynthesisReport2018_WaterandSanitation_04122018">http://www.unwater.org/app/uploads/2018/12/SDG6_SynthesisReport2018_WaterandSanitation_04122018</a> .

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European Parliament and Council	2000	The EU Water Framework Directive		<a href="https://ec.europa.eu/environment/water/water-framework/index_en.html">https://ec.europa.eu/environment/water/water-framework/index_en.html</a>
Roxana L. Ciurean, Dagmar Schröter and Thomas Glade	2017	Conceptual Frameworks of Vulnerability Assessments for Natural Disasters Reduction		<a href="https://www.intechopen.com/chapter/pdf-download/42656">https://www.intechopen.com/chapter/pdf-download/42656</a>
<b>Optional reading</b>				
United Nations	2015	Sendai Framework for Disaster Risk Reduction 2015 - 2030		<a href="https://www.preventionweb.net/files/43291_sendaiframeworkfordrren.pdf">https://www.preventionweb.net/files/43291_sendaiframeworkfordrren.pdf</a>