

Course unit (module) title							Code				
Glacial geology											
Lecturer(s)				Department(s) where the course unit (module) is delivered							
Coordinator: Prof. Petras Šinkūnas				Department of Geology and Mineralogy, Faculty of Chemistry and Geosciences, Vilnius University, M. K. Čiurlionio str. 21/27, LT-03101 Vilnius							
Study cycle				Type of the course unit (module)							
Full-time studies (2 nd stage, master).				Optional							
Mode of delivery			Period when the course unit (module) is delivered			Language(s) of instruction					
Face-to-face			Autumn semester			Lithuanian					
Requirements for students											
Prerequisites: Physical Geology; Quaternary geology and Geomorphology; Sedimentary Petrography				Additional requirements (if any): English reading and comprehension							
Course (module) volume in credits		Total student's workload		Contact hours			Self-study hours				
5		133		48 (32 – lectures; 16 – seminars and tutorials)			85				
Purpose of the course unit (module): programme competences to be developed											
To deepen knowledge and skills in different aspects of Quaternary Geology related to geological processes occurred during Quaternary glaciations, enabling students to understand and analyse complex proxy data on glacial environments, related processes and products, to analyse the structure and architecture of glacial sediment sequences.											
Learning outcomes of the course unit (module)				Teaching and learning methods			Assessment methods				
<p><i>Knowledge:</i> Processes and products related to the continental glaciations, structure and composition of the Quaternary sediment sequences.</p> <p><i>Cognitive skills:</i> Recognise and understand the nature and evolution of glacial geological processes and phenomena in systemic way; analyse and define their regularities in space and time.</p> <p><i>Practical skills:</i> Analysis of reference scientific literature sources and the other publications, efficient search of geological information.</p> <p><i>Transferable skills:</i> Ability to find the scientific and the other geological information in primary and secondary sources (including internet and digital databases), skills to collect the required data in the integral information flow.</p>				Lectures, problem based learning; seminar, tutorials, self-study of reference material.			Evaluation of the activeness in seminars and self-study material presentation, final written-oral exam.				
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
1. Introduction: aim, content, work plan, assessment, literature				2					2	1	Bennett, Glasser, 2009, 1-6.
2. Chronology, features and climate of the Quaternary period				2		1			2	5	Chapman et al., 2000, 3-29.
3. Cryosphere and glaciations				2		1			3	6	Chapman et al., 2000, 49-66; Bennett, Glasser, 2009, 7-39.
4. Mass Balance and the Mechanisms of				2		1			3	6	Bennett, Glasser, 2009,

Ice Flow									41-79.
5. Glacier hydrology	2		1				3	6	Bennett, Glasser, 2009, 81-107.
6. Processes of glacial erosion	2		1				3	5	Bennett, Glasser, 2009, 109-134.
7. Landforms of glacial erosion	2		1				3	6	Bennett, Glasser, 2009, 135-184.
8. Glacial debris entrainment and transport	2		1				3	6	Bennett, Glasser, 2009, 185-206.
9. Direct glacial sedimentation on land	2		1				3	5	Bennett, Glasser, 2009. 207-235.
10. Glaciofluvial sedimentation on land	2		1				3	6	Bennett, Glasser, 2009, 235-246.
11. Ice marginal moraines and subglacial landforms	2		1				3	5	Bennett, Glasser, 2009, 247-289.
12. Glaciofluvial ice-marginal and subglacial landforms	2		1				3	6	Bennett, Glasser, 2009, 289-304.
13. Glacial sedimentation in water	2		1				3	6	Bennett, Glasser, 2009, 305-325.
14. Landforms of glacial deposition in water	2		1				3	5	Bennett, Glasser, 2009, 329-345.
15. Palaeoglaciology	2		1				3	6	Bennett, Glasser, 2009, 348-375; Chapman et al., 2000, 43-47.
16. Structure of glacial deposit sequences	2		1				3	5	Self-study of reference material
Preparing to the exam.			1				2		
Total		32	2	14			48	85	
Assessment strategy	Weight, %	Deadline	Assessment criteria						
Activeness in seminars	10% (1 point)	During the term	1 point: active in the discussions, asking questions, displaying knowledge; 0 points: do not participate actively.						
Presentation	10% (1 point)	During the term	1 points – provides an informative illustrated presentation on the chosen topic; 0 points – topic poorly or not presented.						
Final written and oral examination	80% (8 points)	End of the term	The exam consists of two wide questions. 8-7 - excellent knowledge; 6 - good knowledge, slight discrepancies; 5 - good knowledge, minor mistakes; 4 - average knowledge, mistakes; 3 - average knowledge, important mistakes; 2 - weak knowledge, response not to all questions; 1 – minimum knowledge, not response to questions. 0 – knowledge below the minimum requirement.						
Author	Year of publication	Title	Issue of a periodical or volume of a publication	Publishing place and house or web link					
Compulsory reading									
Bennett M. R, Glasser N.F.	2009	Glacial Geology: Ice Sheets and Landforms.		Wiley-Blackwell					

Optional reading				
Chapman J.A., Drury S.A., Wilson R.C.L.	2000	The Great Ice Age: Climate Change and Life.		Taylor & Francis Group
Goudie A. and Stokes S.	2007	Global Environments Through the Quaternary. Exploring Environmental Change.		Oxford Univ. Press
Ehlers, J., Gibbard, P.L., Hughes P.D. (Eds)	2011	Quaternary Glaciations - Extent and Chronology. A closer look.	Devel. in Quatern. Sc. 15	Elsevier Ltd.
Ehlers, J. & Gibbard, P.L (eds)	2004	Quaternary Glaciations – Extent and Chronology, Part I: Europe.		Elsevier
Menzies J.	2002	Modern and Past Glacial Environments.		Butterworth-Heinemann, Elsevier group