COURSE UNIT (MODULE) DESCRIPTION

Course unit (module) title			Code
Geodynamics and Sedimentary Basin Analysis			
Lecturer(s)		**Department(s) where the course unit (module) is delivered**	
Coordinator: assoc. prof. dr. Jurga Lazauskienė		Institute of Geosciences, 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 (2st stage, master).		Compulsory	
Mode of delivery	**Period when the course unit (module) is delivered**	**Language(s) of instruction**	
Face-to-face	Autumn semester (1th semester).	Lithuanian/English.	
Requirements for students			
Prerequisites: Geotectonics, structural geology, geophysics, sedimentary petrography	**Additional requirements (if any):** none		
Course (module) volume in credits	**Total student's workload**	**Contact hours**	**Self-study hours**
5	**133**	**48 (32 – lectures; 16 – seminars, tutorials)**	**85**

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

To provide the knowledge about the fundamental physical processes necessary to understanding the mechanisms of plate tectonics, sedimentary basin formation and the other processes of lithosphere dynamics. The course analyses the structure of Earth on a large scale caused by geodynamic processes that would be analyzed using basic physics, mathematics, kinematic and dynamic descriptions; to understand and explain principles and methods of cognition of geological environment and geological processes, their mechanisms and evolution. To uunderstand formation of Sedimentary basins in a particular tectonic context (compressive, extensional or strike-slip) and sharing certain characteristics. Basins are created and filled by coupled processes that cause subsidence and generate and deliver sediment to the basin. To read the basin fill as a record of tectonic and sedimentary events, it is necessary to understand how these processes create the sedimentary record in each basin. This course will cover these processes and their interactions.

Learning outcomes of the course unit (module)	Teaching and learning methods	Assessment methods
The students will: - demonstrate the knowledge of the lithospheric geodynamic processes; understanding of the principles between deep and the surface processes of the Earth and their role in formation and evolution of the sedimentary basins.	Lectures, problem based learning; collecting and systemization of the information, exercises.	Intermediate assessments of the performance during the lectures; (open/close type tasks and questions).
- be able to identify and analyze new problems in sedimentary basin analysis and inter-disciplinary theories; to identify and solve the applicable and fundamental questions in geodynamics. - understand and explain the major geodynamic processes for the sedimentary basin formation in a systematic way.	Methods of the active tutoring, involving lecture (fall of ideas, group discussions, debates), personal preparation and presentation of tasks	Intermediate assessments of the performance during the lectures; Assessment of self-prepared tasks.
- would be able to asses and interpret the results of the geodynamic investigations and sedimentary basin analysis in the context of the different hypotheses. - have skills to collect and analyze the research papers; to master the effective methods of search for geodynamic data. - have skills to understand, analyze and interpret the	Research and self-study methods (search for the information, analysis of the scientific papers, preparation and presentation of the oral presentation), debates, fall of	Defense of self-prepared presentation.

geodynamic data, their importance and applicability in the sedimentary basin analysis and practice; skills of self-studies; ability to convey knowledge in oral and written forms. - will be able to apply modern modelling techniques, for the processing of geological information and interpretation of results. - have skills to use the computer technologies and the other means for collecting research and the other information, be able to use the data bases; - have skills efficiently work in a team and autonomously in multi-disciplinary and inter-disciplinary fields, skills required for life-long professional training. - would be prepared for a third cycle studies in geology.	ideas. Lectures, problem based learning; exercises; self-study. Research and self-study methods (search for the information, analysis of the scientific papers, preparation and presentation of the oral presentation), debates, fall of ideas.	 Intermediate assessments of the performance during the lectures; Assessment of self-prepared tasks Defense of self-prepared presentation, final written examination

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. The concepts of the geotectonics. Introduction to Sedimentary Basins Analysis; classification of the Sedimentary basins	3						**3**	**4**	Analysis of the map, test.
2. Foundations of sedimentary basins Basins: Stress and strain . Heat and temperature; geothermal lithosphere;	4		2				**6**	**7**	Self-study of reference material.
3. Foundations of sedimentary basins: elasticity and flexure; gravity. Strength and Rheology of lithosphere	4		2				**6**	**8**	Self-study of reference material. Preparation and presentation of tasks.
4. Mechanical properties of lithosphere; Impact of mechanical properties of the lithosphere on formation and evolution of the sedimentary basins.	4		2				**7**	**8**	Self-study of reference material.
5. Complex aanalysis of the geodynamic mechanisms, as the major driving forces for the formation and evolution of the sedimentary basins.	5		2				**7**	**8**	Self-study of reference material. Preparation and presentation of tasks.
6. Sedimentary infill of basins: Reconstruction of provenance areas (climate, tectonic setting, provenance lithologies, etc.). Transportation and accumulation of sediments, reconstruction methods; Cyclicity of sedimentation, analysis, dynamic stratigraphy; Burial of sediments, subsidence reconstruction, diagenesis, reconstruction of burial condition	4		2				**6**	**7**	Self-study of reference material.
7. Analysis of the sedimentary basin applied to the Baltic basin.	4		3				**6**	**7**	Self-study of reference material.
8. Self-studies of the scientific publications: individually prepared study of selected Sedimentary Basin; presentation of the analysis of selected problem of the geodynamics (based on the case study of real	3		3				**6**	**26**	Self-study of self-selected reference material; preparation and presentation of the oral presentation.

sedimentary basin); presentation of the prepared oral presentation during the special seminar									
9. Preparation for the final exam and examination.		1					**1**	**10**	Self-study of reference material. Written presentation of knowledge
Total	**32**	**1**	**15**				**48**	**85**	

Assessment strategy	**Weight,%**	**Deadline**	**Assessment criteria**
Assessments of the performance during the lectures	10%; 1 grade	During the term	1 point: active in discussion, can answer to questions, forming the scientific problems and questions, formulates problematic questions and critical remarks. 0,5 point: participates in discussion, can answer the questions. 0: do not participate in lectures and seminars, do not answer the questions.
Preparation and oral presentation of self-prepared case study	40%; 4 grades	During and at the end of the term	Self-prepare case study and oral presentation assessed based on the understanding of the basic geodynamic concepts, comprehensiveness and brevity, clearness of the selected problematic and sources of the publications, degree of understanding of the chosen subject; the performance in presenting results of analysis in oral. Assessment of presentation: - composition of self-study and presentation: study and presentation has main chapters, material is comprehensive, analysis consistent, conclusions clear and relevant to the materials (4-3 points) - presentation of material: clear text, figures, well selected references; proper citation of references (2-1point) Presentation not prepared - 0 point.
Final written examination	50%; 5 grades	End of the term	It is obligatory to self-prepare and present the oral presentation before the final examination. Accumulative score, 5-point system. The score of the final exam would include evaluation of the answers to two written questions and oral question(s) in a course of exam. Answers to the three questions: 5 points – outstanding knowledge; Level of evaluation. 4 points – excellent knowledge. Level of synthesis. 3 points – good knowledge, can be minor mistakes. Level of analysis. 2 points – average knowledge, mistakes. Level of applying knowledge. 1 point – knowledge and skills still fits into minimum requirements, there are a lot of mistakes. Level of knowledge and understanding. 0 – knowledge is 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**
Compulsary reading				
Turcotte, D.L. and Schubert G.	2002/2014	Geodynamics		Cambridge University Press, UK, 441 p. /612 p.
Stuwe K.	2002	Geodynamics of Lithosphere. An introduction		Springer, 449.
Philip A. Allen, John R. Allen	2004	Basin Analysis: Principles and Applications, 2nd		Wiley-Blackwell

		Edition		
Angevine, C.L., P.L. Heller, C. Paola	1990	Quantitative Sedimentary Basin Modelling		A.A.P.G. Continuing Education Course Note Series No. 32.
Andrew D. Miall	1990	Principles of Sedimentary Basin Analysis		Springer Verlag
Optional reading				
Fowler.C.M.R.	2005/2007	The Solid Earth		Cambridge University Press, UK, 685 p.
Gee D.G., Stephenson R.A. (red.)	2006	European Lithosphere Dynamics		Geological Society, London, Memoirs.
Cathy Busby and Antonio Azor	2012	Tectonics of sedimentary basins: Recent advances		Wiley-Blackwell
Duppenbecker S. J., Eliffe J. E.	1999	Basin Modelling		Geological Society Special Publication