COURSE UNIT (MODULE) DESCRIPTION

Course unit title	Code
Basics of Synoptic meteorology	

Lecturer(s)	Department, Faculty
Coordinating: Gintautas Stankūnavičius **Other:**	Institute of Geosciences Faculty of Chemistry and Geosciences

Study cycle	Type of the course unit
First cycle	Compulsory

Mode of delivery	Period when the course unit (module) is delivered	Language(s) of instruction
Face-to-face	Autumn (V semester)	English

Requirements for students	
Prerequisites: Fundamentals of Meteorology, Physics or Environmental sciences	**Additional requirements (if any):** None

Course (module) volume in credits	Total student's workload	Contact hours	Self-study hours
5	**133**	**48**	**85**

Purpose of the course unit: programme competences to be developed		
To develop understanding and expertise multi-scale atmospheric circulation processes, also ability to analyse weather (synoptic) maps and how they may be used in weather forecasting.		
Learning outcomes of the course unit	**Teaching and learning methods**	**Assessment methods**
student will gain knowledge about the state of the art meteorological information sources: their monitoring systems, the initial data processing and their mapping	Lectures, exercises, self-study	Exam, exercises
will be able critically to assess the quality of meteorological data, rules of weather changes and also to calculate derivative (diagnostic) parameters according available synoptic data	Lectures, exercises, self-study	Exam, exercises
will be familiar with the basic features of extra-tropical pressure systems their links with typical weather: wind field, precipitation, cloud cover, temperature etc	Lectures, exercises, self-study	Exam, exercises
will be able to diagnose weather patterns and to produce as well as interpret the short-term weather forecast:	Lectures, exercises, self-study	Exam, exercises

Course 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. Introduction. Historical development of synoptic meteorology; Weather maps, their structure. Geopotential. Synoptic weather forecasting techniques. .	2		1				**3**	**2**	Reading and analysis of textbooks
2. Observation data. Conventional observations: surface stations, radiosounding stations, buoys, remote sensing systems etc. The main variables describing atmospheric circulation and their mapping: scalar and vector fields. Isobaric surfaces. Synoptic scale waves. Jet streams	3			4			**7**	**5**	Reading and analysis of textbooks. Exercise
3. Synoptic maps. Weather maps processing steps and rules. Contour method and interpolation. Weather maps Error detection and correction. Absolute and relative topography. The relationship between the different isobaric surfaces. Weather analysis techniques. Auxiliary maps. Atmospheric fronts: their types and location detection.	5			5			**10**	**6**	Reading and analysis of textbooks. Exercise
4. Quantitative analysis of weather maps. Horizontal and vertical wind components, geostrophic and gradient wind, divergence and vorticity, thermal wind conception. The particle trajectory, streamfuction.	4			6			**10**	**12**	Reading and analysis of textbooks. Exercise
5. Atmospheric circulation in mid-latitudes. Air masses: classification methods, classical detection methods; transformation. Atmospheric fronts: classification, frontal surface inclination. Characteristic of warm, cold and occluded fronts. Extra-tropical cyclones and anticyclones, their characteristic features	4		1	1			**6**	**12**	Reading and analysis of textbooks. Exercise
6. Evolution of synoptic scale structures. Quassi-geostrophic theory of pressure system evolution. Vorticity equation. Spatial structure of lows and highs at different stages of evolution. Cyclo-genesis and -lysis and regeneration process.	3		2	4			**12**	**36**	Reading and analysis of textbooks. Exercise
7. Synoptic forecasting method. Typical weather situations. Local weather detection. Classification of weather prediction techniques and types. Severe weather forecasting. Existing alert systems. Remote sensing data for the very short range weather forecasting and nowcasting.	3		2	1			**6**	**24**	Reading and analysis of textbooks. Exercise
8. Preparation for the final test (exam)								**6**	
Total	**24**		**5**	**19**			**48**	**85**	

Assessment strategy	**Weight %**	**Deadline**	**Assessment criteria**
Active participation in 4 seminars.	5 %	During the semester	Maximum number of points for every seminar - 10. Total maximum number of points - 40.
Essay	25 %	During the semester	Maximum number of points for presentation – 4, for content - 6. Total maximum number of points - 10.
Exam. Test consists of 10 open and closed type	40%	During the session	Maximum number of points - 10.

questions.			
Exam. Oral and written form. Consists of 1 wide topic	30 %	During the session	Maximum number of points - 10.
	Cumulative grade is calculated as follows: C = (0.05 * M)/ 4 + 0.25*E + 0.40*Te+ 0.3*OWe where M - the total number of points for all scientific reports made during seminars; E - essay rating Te - test rating OWe – oral-writing exam rating A positive final assessment is possible only if the all individual tasks are completed.		

Author	**Year of publication**	**Title**	**Issue of a periodical or volume of a publication; pages**	**Publishing place and house or web link**
Compulsary reading				
Lehkonen A.	2013	Synoptic Meteorology Textbook		http://eumetrain.org/synoptic_textbook.html
J. E. Martin	2011	Mid-latitude atmospheric dynamics: a first course		John Willey & Sons Ltd.
EUMeTrain	2016	Manual of Synoptic Satellite Meteorology		http://www.eumetrain.org/satmanu/index.html
Optional reading				
Bluestein H. B.	1993	Synoptic-dynamic meteorology in midlatitudes: observations and theory of weather systems	II	Oxford University Press
Kurz M.	1998	Synoptic Meteorology		Offenbach am Main : Deutscher Wetterdienst
Vasquez T.	2008	Weather Map Handbook		Weather Graphics Technologies, USA

Databases, maps and the software	
Title of database	**Link**
Surface Observations	http://weather.uwyo.edu/surface/meteorogram/
METAR and TAF reports in Europe	http://en.allmetsat.com/metar-taf/europe.php
Meteorological Charts North Atlantic and Europe	a) http://www.met.reading.ac.uk/~brugge/europe.html b) http://www.weathercharts.org/
Weather Graphics Digital Atmosphere	http://www.weathergraphics.com/da/
UQAM Weather Centre Surface observations	http://meteocentre.com/surface/index_e.html
EUMeTrain - ePort	http://eumetrain.org/eport.html
Meteorological Analyses over Europe	http://wxmaps.org/pix/euro.00hr.html
Queries about Synop reports	http://www.ogimet.com/synops.phtml.en

Realtime Satellite Images	http://imkhp2.physik.uni-karlsruhe.de/~muehr/satbilder_e.html