

COURSE OF DOCTORAL STUDIES

Course title	Field of science (branch) code	University / Faculty	Institute / Department
Synoptic Climatology	Natural Sciences, (Physical Geography) N006	Vilnius University / Faculty of Chemistry and Geosciences	Institute of Geosciences / Department of Hydrology and Climatology
Study methods	Number of credits allocated	Study methods	Number of credits allocated
Lectures		Consultations	1
Individual work	8	Seminars	1
Course annotation			
<p>Objective: the primary objective of this course is an explanatory analysis of low frequency variability of atmospheric processes at various spatial scales: global, hemisphere and regional. The course is intended to help students understand climate aspects in terms of atmospheric circulation patterns and modes.</p> <p>Content. Object and definition of synoptic climatology. Methods applied in synoptic climatology: synoptic, statistical and hydrodynamic. The concept of general circulation of atmospheric (GCA) as one of the main climatic factor and as a climate property. Factors influencing GCA on various scales: Insolation, absorption and other properties of solar radiation; Earth rotation; thermal and dynamic interaction of the atmosphere with the surface; geophysical and astronomic factors. Air masses: their properties and classification. Climatic fronts. Mean zonal circulation and troposphere – stratosphere interaction. Jet streams. Blocking processes. Surface pressure field, circulation in mid-latitudes, extratropical cyclones and anticyclones. Inter-tropical atmospheric disturbances. Hadley cell, Intertropical convergence zone (ITCZ), Monsoons, Tropical cyclones. Baroclinic instability and the development of extratropical disturbances. Waves in atmosphere, Rossby waves.</p> <p>Teleconnections in atmosphere and oceans (ENSO, AO). Teleconnections in extratropics (NAO, EA, PNA etc) and in tropics (MJO, IOD etc) and their interaction. General principles of classification of the large scale atmospheric processes. The usefulness of (atmospheric) circulation indices. Global circulation modeling: model types, their application in climate research.</p>			
Required readings			
Barry R. G., Carleton A. M. 2001. Synoptic and Dynamic Climatology. Routledge. London and New York			
Bridgman H., Oliver J 2006. The global Climate System. Patterns, Processes, and Teleconnections. Cambridge University.			
McGuffie, Henderson–Sellers A. 2005. A Climate Modelling Primer. Sydney.			
Markowski P. M., Richardson Y. P. 2010. Mesoscale Meteorology in Mid-Latitudes. WILEY-BLACKWELL			
Seamless prediction of the Earth system: from minutes to months. 2015. WMO-No. 1156. Geneva. ISBN 978-92-63-11156-2.			
Online version: https://library.wmo.int/pmb_ged/wmo_1156_en.pdf			
Consulting lecturers Name, surname	Degree	The most important works in the field of science (branch) have been published during the last 5 years	
Arūnas Bukantis	dr. (HP)	<p>Šarauskiene, D., Akstinas, V., Kriaučiūnienė, J., Jakimavičius, D., Bukantis, A., Kažys, J., Povilaitis, A., Ložys, L., Kesminas, V., Virbickas, T., Pliūraitė, V. 2017. Projection of Lithuanian river runoff, temperature and their extremes under climate change. <i>Hydrology Research</i> 49(2): 344-362.</p> <p>Stonevičius, E., Rimkus, E., Kažys, J., Bukantis, A., Kriaučiūnienė, J., Akstinas, V., Jakimavičius, D., Povilaitis, A., Ložys, L., Kesminas, V., Virbickas, T., Pliūraitė, V. 2018. Recent aridity trends and future projections in the Nemunas River basin. <i>Climate Research</i> 75(2): 143–154.</p> <p>Povilaitis, A., Widén-Nilsson, E., Šarauskiene, D., Kriaučiūnienė, J., Jakimavičius, D., Bukantis, A., Kažys, J., Ložys, L., Kesminas, V., Virbickas, T., Pliūraitė, V. 2018. Potential impact of climate change on nutrient loads in Lithuanian rivers. <i>Environmental engineering and management journal</i>. ISSN 1582-9596. Vol. 17 (9): 2229-2240.</p> <p>Kriaučiūnienė, J., Virbickas T., Šarauskiene, D., . Jakimavičius, D., Kažys, J., Bukantis, A., Kesminas, V., Povilaitis, A., Dainys, J., Akstinas, V., Jurgelėnaitė, A., Meilutytė-Lukauskienė, D., Tomkevičienė, A. 2019. Fish assemblages under climate change in Lithuanian rivers. <i>Science of The Total Environment</i>. Vol. 661: 563-574.</p> <p>Dainys, Justas, Jakubavičiūtė, Eglė, Gorfine, Harry, Pūtys, Žilvinas, Virbickas,</p>	

		<p>Tomas, Jakimavičius, Darius, Šarauskienė, Diana, Meilutytė-Lukauskienė, Diana, Povilaitis, Arvydas, Bukantis, Arūnas, Kažys, Justas, and Ložys, Linas. 2019. Predicted Climate Change Effects on European Perch (<i>Perca Fluviatilis L.</i>) - A Case Study from the Curonian Lagoon, South-eastern Baltic. <i>Estuarine, Coastal and Shelf Science</i> 221 (2019): 83-89.</p>
Gintautas Stankūnavičius	dr.	<p>Valiuškevičius G., Stonevičius E., Stankūnavičius G., Brastovickytė-Stankevič J. 2018. Severe floods in Nemunas River Delta. <i>Baltica</i>, 31(2), 89–99. https://doi.org/10.5200/baltica.2018.31.09.</p> <p>Stonevicius E., Stankunavicius G., and Rimkus E. 2018. Continentality and oceanity in the mid and high latitudes of the Northern hemisphere and their links to atmospheric circulation. <i>Advances in Meteorology</i>, https://doi.org/10.1155/2018/5746191.</p> <p>Basharin D. and Stankūnavičius G. 2018. The long-term 20th century re-analysis features over the North Atlantic-Eurasia region. <i>Boreal Environmental Research</i>, 23, 139–148.</p> <p>Stankūnavičius G., Basharin D.V., Skorupskas R., Vivaldo G. 2017. Euro-Atlantic blocking events and their impact on surface air temperature and precipitation over the European region in the 20th century. <i>Climate Research</i>, 71, 203–218. https://doi.org/10.3354/cr01438</p> <p>Basharin D.V., Polonsky A.B., Stankunavicius G. 2016. Projected precipitation and air temperature over Europe using a performance-based selection method of CMIP5 GCMs. <i>Journal of water and climate change</i>. 7 (1), 103-113, doi:10.2166/wcc.2015.081</p> <p>Jarmalavičius D., Šmatas V., Stankūnavičius G.; Pupienis D., and Žilinskas G. 2016. Factors controlling coastal erosion during storm events. In: Vila-Concejo, A.; Bruce, E.; Kennedy, D.M., and McCarroll, R.J. (eds.), <i>Proceedings of the 14th International Coastal Symposium (Sydney, Australia)</i>. <i>Journal of Coastal Research, Special Issue, No. 75</i>, pp. 1112 - 1116. Coconut Creek (Florida), ISSN 0749-0208.</p>
Approved by the Doctoral Committee for Physical Geography (N006) on 9th of March 2021, protocol no. (4.20 E) 610000-KT-24		
Committee Chairman assoc. prof. dr. D. Pupienis		