

COURSE OF DOCTORAL STUDIES

Course title	Field of science (branch) code	University / Faculty	Institute / Department
Potamology	Natural Sciences (Physical Geography) N 006	Vilnius University /Faculty of Chemistry and Geosciences Nature research centre	Institute of Geosciences / Department of Hydrology and Climatology Laboratory of climate and water research
Study methods	Number of credits allocated	Study methods	Number of credits allocated
Individual work	9	Practical work	
Consultations	1		
Course annotation			
<p><u>The course aims:</u> acquaint doctoral students with the structure and development of rivers, hydrological, hydrophysical, hydrochemical and geomorphological processes in rivers, lotic ecotones and their hydrological and ecological significance.</p> <p><u>Hydrosphere.</u> Hydrosphere components, their water static and dynamic reserves, water renewal time. Hydrosphere integrity and discretion. Hydrological objects and processes.</p> <p><u>River basin.</u> Watershed. Surface basin and underground basin. Basin area and volume. Morphometric, physical geographical and economic indicators of the basin. Rivers network structure and hierarchy. Upstream and downstream specifics. Elements of the hydrographic network. Horton's laws. Evolution of rivers. River valleys, their elements, formation and types. The riverbed and its structure. River bottom relief.</p> <p><u>River runoff.</u> Factors determining runoff. River runoff regime. River runoff sources and their classifications. Hydrographs, their decomposition. Unit hydrograph. Formation of spring floods and rain floods. Flood wave movement in the river. Hydrological forecasting methods. Types of runoff. Runoff measurements and modeling. River runoff long-term fluctuations. River regulation. Basin water resources management and its features. Runoff databases, longest data sequences and possibilities of their use.</p> <p><u>River water level fluctuations.</u> Factors determining water level fluctuations. Water level regime indicators. Water level databases, the longest data sequences in the World, Europe and Lithuania. Relationships between river water level and runoff.</p> <p><u>Sediments transport in rivers.</u> Sediments formation. Sediments flow. Suspended sediments and their movement. Hydraulic size of sediments. Distribution of suspended sediments in stream. Bottom towed sediments. River sediment flow regimes. River bed deformations. Interaction between stream and riverbed. Movement of bottom sediment waves. Sediments accumulation. Forms of flowing water erosion. Transverse sediment transport in riverbed. Changes in the ratio of erosion to accumulation in a river. Annual and long-term riverbed deformations. Types of channel processes. Channel meandering. Factors determining the geometry of meanders.</p> <p><u>River hydrochemistry.</u> Water salinity. Sources of salts. Major ions in river water. Factors determining the distribution of ions dissolved in water. Hydrochemical classification of rivers. Dependence of water salinity on river runoff sources. Ranges of river water salinity change in the world and in Lithuania. Water specific electrical conductivity. River water quality and its classifications. River eutrophication. Water quality monitoring. Water quality management methods.</p> <p><u>Thermal and ice regimes of rivers.</u> Determinants of water temperature. Annual and multiannual change of water temperature, its forecasting. Ice phenomena in rivers. Ice jams and their impact on the river regime. The longest data sequences of ice phenomena in the world and in Lithuania. Changes in river ice phenomena in the context of climate change.</p> <p><u>River (lotic) ecotones.</u> Ecological and hydrological significance of lotic ecotones. Functions of ecotones. Changes of river ecotones related with river valley evolution and anthropogenic activity in river basin. Influence of aquatic plants on</p>			

runoff regime. Effects of channel morphology and runoff on aquatic plants.		
Required readings		
Bedient, P., Huber, W. C., Vieux, B.. 2013. Hydrology and floodplain analysis. Pearson.		
Hingray, B., Picouet, C. Musy, A. 2014. Hydrology: a science for engineers. CRC Press Book.		
Brutsaert, W. 2012. Hydrology: an introduction. Cambridge University Press		
Baird, A. J., Wilby, R. L. (eds.). 1999. Eco-hydrology: plants and water in terrestrial and aquatic environments. Routledge.		
Recommended reading		
Food and Agriculture Organization of the United Nations, UNECE. 2018. Forests and water: valuation and payments for forest ecosystem services. Geneva: United Nations.		
Kilkus K., Valiuškevičius G. 2006. Antano Bariso hidrologija. Vilniaus universiteto leidykla.		
Smith, D., Stopp, P. 1984. The river basin: An introduction to the study of hydrology. Cambridge: Cambridge University Press.		
Consulting lecturers name, surname	Degree	The most important works in the field of science (branch) have been published during the last 5 years
Gintaras Valiuškevičius	Dr.	Valiuškevičius, G. , Stonevičius, E., Stankūnavičius, G., Brastovickytė-Stankevič, J. 2018. Severe floods in Nemunas River Delta. Baltica, 31(2), Stonevičius, E., Valiuškevičius, G. 2018. Identification of Significant Flood Areas in Lithuania. Water Resources, 45(1), 27–33. Stonevičius, E., Rimkus, E., Štaras, A., Kažys, J., Valiuškevičius, G. 2017. Climate change impact on the Nemunas River basin hydrology in the 21st century. Boreal Environment Research, 22, 49–65. Valiuškevičius, G. 2017. Steponas Kolupaila's contribution to hydrological science development. History of Geo- and Space Sciences, 8, 57–67.
Julius Taminskas	Dr.	Taminskas, J. , Šimanauskienė, R., Linkevičienė, R., Volungevičius, J., Slavinskienė, G., Povilanskas, R., Satkūnas, J. 2020 Impact of hydro-climatic changes on coastal dunes landscape according to normalized difference vegetation index (The case study of Curonian Spit). Water, 12 (11): art. no. 3234 Edvardsson, J., Baužienė, I., Lamentowicz, M., Šimanauskienė, R., Tamkevičiūtė, M., Taminskas, J. , Linkevičienė, R., Skuratovič, Ž., Corona, C., Stoffel, M. 2019 A multi-proxy reconstruction of moisture dynamics in a peatland ecosystem: A case study from Cepkeliai, Lithuania. Ecological Indicators. 106: art. no. UNSP 105484. Tamkevičiūtė, M., Edvardsson, J., Pukienė, R., Taminskas, J. , Stoffel, M., Corona, C., Kibirkštis G. 2018. Scots pine (Pinus sylvestris L.) based reconstruction of 130 years of water table fluctuations in a peatland and its relevance for moisture variability assessments. Journal of Hydrology. 558, 509-519. Taminskas, J. , Linkevičienė, R., Šimanauskienė, R., Jukna, L., Kibirkštis, G., Tamkevičiūtė, M. 2018. Climate change and water table fluctuation: Implications for raised bog surface variability. Geomorphology. 304, 40-49. Taminskas, J. , Edvardsson, J., Linkevičienė, R., Stoffel, M., Corona, C., Tamkevičiūtė, M. 2019. Combining multiple proxies to investigate water table fluctuations in wetlands: A case study from the Rėkyva wetland complex, Lithuania. Palaeogeography, Palaeoclimatology, Palaeoecology. 514, 453-463.
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		