COURSE OF DOCTORAL STUDIES

Course title	Field of science (branch) code	University / Faculty	Institute / Department
Application of R programing in spatial and statistical analysis	Natural Sciences, (Physical Geography) N 006	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
Individual work	7	Consultations	3

Course annotation

<u>Purpose of the course:</u> provide theoretical and practical knowledge on application of R programing in spatial and statistical analysis of environment data.

<u>Study topics.</u> Data objects and data types. Importing data. Subsetting data. Tidying data. Aggregating data. Data joins in R. Factors and dates. Functions in R. If and switch controls. Looping with for, while and repeat. Vectorized computations. Iterating vector data. Graphics in R. The plot function. The ggplot2 package. Aesthetics. Geoms. Faceting. Plots with several layers.

Statistical summaries and tests. Probability distributions and random numbers. Regression models. Linear regression models. Modelling functions. Performance measures. Nonlinear regression. NetCDF data and its structure. R packages for NetCDF. NetCDF structure (dimensions, attributes, variables).

Spatial data in R. Spatial libraries. Vector data in R. Working with attribute data. Overlay of vector data. Raster classes. Creating and importing raster objects. Accessing cell values. Summarizing functions. Raster algebra and overlay. Plotting raster data.

Required readings

Wickham H., Grolemund G. 2021. *R for Data Science: Visualize, Model, Transform, Tidy and Import Data*. https://r4ds.had.co.nz

Wickham H., 2021. *ggplot2 ElegantGraphics for Data Analysis*. https://ggplot2-book.org/#welcome

Pebesma E., Bivand R. 2020. *Spatial Data Science*. https://keen-swartz-3146c4.netlify.app

Michna P., Woods. M.2020. Package 'RNetCDF' https://cran.r-project.org/web/packages/RNetCDF/index.html

Hijmans R. J. 2020. Introduction to the 'raster' package.
https://cran.r-project.org/web/packages/raster/vignettes/Raster.pdf

Consulting lecturers name, surname	Degree	The most important works in the field of science (branch) have been published during the last 5 years
Edvinas Stonevičius	Dr.	Rimkus, E., **Stonevičius, E.,** Kilpys, J. Mačiulytė, V., Valiukas, D. 2017. Drought identification in the eastern Baltic region using NDVI. Earth system dynamics, 8, 627-637. **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. **Stonevičius, E.,** Valiuškevičius, G., 2018. Identification of significant flood areas in Lithuania. Water resources. 45(1), 27-33. **Stonevičius, E.,** Rimkus, E., Kažys, J., Bukantis, A., Kriaučiūnienė, J., Akstinas, V., Jakimavičius, D., Povilaits, A, Ložys L., Kesminas, V., Virbickas, T., Pliūraitė, V. 2018 Recent aridity trends and future projectons in the Nemunas River basin. Climate Research. 75(2):143-154. **Stonevicius, E.,** Stankunavicius, G., Rimkus, E. 2018. Continentality and Oceanity in the Mid and High Latitudes of the Northern Hemisphere and Their Links to Atmospheric Circulation. Advances in Meteorology, vol. 2018, Article ID 5746191, 12. Rimkus, E., Briede, A., Jaagus, J., **Stonevicius, E.,** Kilpys, J., Viru, B. 2018: Snow-

		cover regime in Lithuania, Latvia and Estonia and its relationship to climatic and geographical factors in 1961-2015. Boreal Env. Res. 23: 193-208.
		Valiuškevičius, G., **Stonevičius, E.**, Stankūnavičius, G., Brastovickytė-Stankevič, J. 2018. Severe floods in Nemunas River Delta. Baltica, 31 (2), 89–99.
		Rimkus, E., Mačiulytė, V., **Stonevičius, E**., Valiukas, D. 2020. A revised agricultural drought index in Lithuania. Agricultural and Food Science, 29(4), 359–371.

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