

COURSE OF DOCTORAL STUDIES

Course title	Field of science (branch) code	University / Faculty	Institute / Department
Statistical methods in geosciences	Natural Sciences (Physical Geography) N 006	Klaipėda University Vilnius University / Faculty of Chemistry and Geosciences	Marine Research Institute Institute of Geosciences / Department of Hydrology and Climatology
Study methods	Number of credits allocated	Study methods	Number of credits allocated
Lectures		Seminars	
Individual work	9	Consultations	1
Course annotation			
After completing this course, doctoral students will be able to effectively analyze scientific information and conduct research. They will acquire skills to collect, interpret, and analyze data in the geosciences and master statistical methods applied in this field. They will be able to understand and critically evaluate statistical analysis results presented in professional literature. Course Content Descriptive statistics. Measures of central tendency and dispersion. Theoretical distributions. The most commonly used continuous and discrete distributions in geosciences. Monte Carlo method. Markov chain. Testing of statistical hypotheses. Null and alternative hypotheses. Significance level. Parametric and non-parametric statistics. Criteria for the goodness of fit between theoretical and empirical distributions. Testing hypotheses on equality of means and variances. Analysis of variance (ANOVA). Errors in statistical indicators and confidence intervals. Relationship between two or more variables. Concept of regression and its types. Least squares method. Theil-Sen method. Pearson correlation coefficient. Coefficient of determination. Non-parametric coefficients of correlation. Logistic regression. Multivariate regression. Statistical significance of correlation. Decision trees. Time series analysis. Analysis of periodic fluctuations. Harmonic analysis. Autocorrelation analysis. Spectral analysis. Trend analysis. Statistical significance of trends. Parametric t-test. Non-parametric Mann-Kendall and Cox-Stuart tests. Multivariate statistical analysis methods. Cluster analysis. Factor analysis. Discriminant analysis. Multidimensional scaling. Canonical correspondence analysis. Redundancy analysis. Geostatistical methods. Spatial autocorrelation and hot spot detection. Interpolation models and their validation. Artificial neural networks.			
Required readings			
Acevedo M.F. 2012. Data Analysis and Statistics for Geography, Environmental Science, and Engineering. Taylor & Francis Group. https://virtualbiblioteka.vu.lt/~statistical-methods-for-climate-scientists/85F85ED46389BBD726E41F2EE8AA6824			
DelSole, T., & Tippet, M. 2022. Statistical Methods for Climate Scientists (1st ed.). Cambridge University Press. https://www.cambridge.org/core/books			
Ebdon D. 2005. Statistics in geography. Oxford : Blackwell.			
Wilks D. S. (1995). Statistical methods in the atmospheric science. Academic press. https://www.sciencedirect.com/bookseries/international-geophysics/vol/100/suppl/C			
Consulting lecturers name, surname	Degree	The most important works in the field of science (branch) have been published during the last 5 years	
Martynas Bučas	dr.	Robbe E., Rogge L., Lesutienė J., Bučas M., Schernewski G., 2024. Assessment of Ecosystem Services Provided by Macrophytes in Southern Baltic and Southern Mediterranean Coastal Lagoons. Environmental Management. Terefenko P., Giza A., Śledziowski J., Paprotny D., Bučas M., Kelpšaitė-Rimkienė L., 2024. Classification of soft cliff dynamics using remote sensing and data mining techniques. Science of The Total Environment, 174743; Schernewski G., Neumann N., Bučas M. and von Thenen M. 2024. Ecosystem services of the Baltic Sea—state and changes during the last 150 years. Environments, 11, 200. Gintauskas J., Bučas M., Vaičiūtė D., Medelytė S., Tiškus E. & Olenin S. 2024. Utilizing sentinel-1 SAR for delineation of narrow intertidal zones and habitat types in Svalbard. International Journal of Remote Sensing.	

		Vaičiūtė D., Sokolov Y., Bučas M., Dabulevičienė T., Zotova O., 2024. Earth Observation-Based Cyanobacterial Bloom Index Testing for Ecological Status Assessment in the Open, Coastal and Transitional Waters of the Baltic and Black Seas. <i>Remote Sens.</i> 16, 696. Tiškus E., Vaičiūtė D., Bučas M. & Gintauskas J. 2023. Evaluation of common reed (<i>Phragmites australis</i>) bed changes in the context of management using earth observation and automatic threshold, <i>European Journal of Remote Sensing</i>, 56:1 Bučas M., Stragauskaitė V., Minicheva G., Sinkevičienė Z., Vaičiūtė D., 2023. Implications of Macrophyte Distribution Patterns in the Curonian Lagoon for Monitoring of Submerged Vegetation in Transitional Water Bodies. <i>Journal of Environmental Research, Engineering and Management (EREM)</i>, 79(2): 6–20. Tiškus E., Bučas M., Vaičiūtė D., Gintauskas J., Babrauskienė I., 2023. An Evaluation of Sun-Glint Correction Methods for UAV-Derived Secchi Depth Estimations in Inland Water Bodies. <i>Drones</i>, 7: 546. Tiškus E., Bučas M., Gintauskas J., Kataržytė M., Vaičiūtė, D. 2023. U-Net Performance for Beach Wrack Segmentation: Effects of UAV Camera Bands, Height Measurements, and Spectral Indices. <i>Drones</i>: 7, 670. Vaičiūtė D., Bučas M., Bresciani M., Dabulevičienė T., Gintauskas J., Mėžinė J., Tiškus E., Umgieser G., Morkūnas J., De Santi F., Bartoli M. 2021. Hot moments and hotspots of cyanobacteria hyperblooms in the Curonian Lagoon (SE Baltic Sea) revealed via remote sensing-based retrospective analysis. <i>Science of The Total Environment</i> 769.
Egidijus Rimkus	dr.	Kilpys J., Pipiraitė-Januškienė S., Rimkus E. 2020. Snow climatology in Lithuania based on the cloud-free moderate resolution imaging spectroradiometer snow cover product, <i>International Journal of Climatology</i>, 40(10), 4690-4706. Rimkus E., Mačiulytė V., Stonevičius E., Valiukas D. 2020. A revised agricultural drought index in Lithuania, <i>Agricultural and food sciences</i> 29 (4), 359–371. Pukienė R., Vitas A., Kažys J., Rimkus E. 2021. Four-decadal series of dendrometer measurements reveals trends in <i>Pinus sylvestris</i> L. inter- and intra-annual growth response to climatic conditions, <i>Canadian Journal of Forest Research</i> 51(3): 445-454. Jaagus J., Aasa A., Aniskevich S., Boincean B., Bojariu R., Briede A., Danilovich I., Castro F. D., Dumitrescu A., Labuda M., Labudová L., Löhmus K., Melnik V., Mõisja K., Pongracz R., Potopová V., Řezníčková L., Rimkus E., Semenova I., Stonevičius E., Štěpánek P., Trnka M., Vicente-Serran S. M., Wibig J., Zahradníček P. 2022. Long-term changes in drought indices in eastern and central Europe, <i>International Journal of Climatology</i>, 42: 225–249. Gečaitė I., Rimkus E. 2023. Wintertime cold and warm spells in the eastern part of the Baltic Sea region, <i>Natural hazards</i>, 115 (3): 2435–2456. Mačiulytė V., Rimkus E., Valiukas D., Stonevičius E. 2023. Long-term precipitation events in the eastern part of the Baltic Sea region, <i>Oceanologia</i>, 69 (1), 141-150. Klimavičius L., Rimkus E., Stonevičius E., Mačiulytė V. 2023. Seasonality and long-term trends of NDVI values in different land use types in the eastern part of the Baltic Sea basin, <i>Oceanologia</i>, 69 (1), 171-181. Klimavičius L., Rimkus E. 2024. Compound drought and heatwave events in the eastern part of the Baltic Sea region, <i>Oceanologia</i>, 66 (1), 26-36. Jaagus J., Rimkus E., Briede A., Sagris V., Aasa A., Kapilovaite J., Sepp M. 2024. Long-term changes in heat wave parameters in the eastern Baltic region. <i>Theoretical and Applied Climatology</i>, 155, 5053–5068. Klimavičius L., Rimkus E. 2024. False spring events in the eastern part of the Baltic Sea region. 2024. <i>Theoretical and Applied Climatology</i>. https://doi.org/10.1007/s00704-024-05194-0 Rimkus E., Stonevičius E., Gečaitė I., Mačiulytė V., Valiukas D. 2024. Impact of Meteorological Conditions on Overhead Transmission Line Outages in Lithuania. <i>Atmosphere</i>, 15(11):1349. https://doi.org/10.3390/atmos15111349
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Committee Chairman prof. dr. D. Pupienis		