

PhD programme in Earth, Environmental and Resources Sciences

Instructor(s)	Prof. Stefano Albanese, DiSTAR-UNINA
Course Title	Statistical Data Analysis with Elements of Geostatistics
Total Number of Hours	16 hours (4 CFU)
Contact Email	stefano.albanese@unina.it

Course Description

This course provides doctoral students with the fundamental tools for statistical analysis of geoscientific data, with a focus on environmental and geochemical applications. It introduces the nature and structure of data, emphasizing data quality, uncertainty, and measurement errors. Students will learn descriptive and inferential statistical methods, including hypothesis testing, correlation, regression, and multivariate techniques. The course also includes an introduction to spatial data analysis and its relevance in geosciences. Practical exercises using real datasets are integrated throughout the course to develop operational skills. The course aims to support students in designing, analyzing, and interpreting geochemical and environmental datasets for research and applied purposes.

Course Contents

1. Nature of data and measurement in geosciences: types of data, measurement processes, uncertainty, accuracy and precision.
2. Descriptive statistics: central tendency, dispersion, graphical methods, distribution properties.
3. Inferential statistics: normality testing, hypothesis testing, ANOVA, confidence intervals.
4. Correlation, regression and multivariate analysis: Pearson and Spearman correlation, linear regression, PCA, FA, CA.
5. Introduction to spatial data analysis: basic concepts and integration with GIS.

Learning Outcomes

By the end of the course, doctoral students will be able to:

- Understand the nature and limitations of geoscientific data
- Apply descriptive statistics to summarize datasets
- Perform and interpret inferential statistical tests



- Analyze relationships between variables using correlation and regression
- Critically evaluate statistical results in geoscience contexts
- Apply basic multivariate and spatial analysis techniques

Teaching Format

Lectures, hands-on exercises, data analysis sessions, and discussion of real case studies.

Essential Bibliography

- David M. Lane, 2013. Introduction to Statistics (Available as web book, PDF or e-Pub and other formats at: <https://onlinestatbook.com/>)
- Statistical Analysis in JASP – A Student’s Guide (Available at: <https://jasp-stats.org/wp-content/uploads/2025/07/Statistical-Analysis-in-JASP-A-guide-for-students-2025.pdf>)
- Danielle J. Navarro, David R. Foxcroft, and Thomas J. Faulkenberry, 2025. Learning Statistics with JASP (Available at: <https://learnstatswithjasp.com/>)
- Selected scientific papers and teaching materials provided during the course

Assessment Method (optional)

Active participation and practical exercises during the course