Syllabus

Teacher (name and affiliation)	Arianna Azzellino (Politecnico di Milano, Dpt. Civil and Environmental Engineering) Paolo Galli (UNIMIB, dep. Earth and Environmental Sciences)
Title	COMPUTER AIDED-STATISTICAL ANALYSIS OF ENVIRONMENTAL DATA
Language	*English*
CFU	*3*
Hours	*24*
Program	**Course Description** In this course we will cover the basics of statistics applied to marine ecology from a very practical perspective, with real data sets and realistic case studies. This course offered in English will develop hands-on expertise for analysing and interpreting ecological data based on applications to field-oriented problems. Hypothesis tests will be explained in light of data with non detects, outliers, and skewed distributions using a computer-aided analysis approach. Methods for estimation and prediction (e.g. regression methods) will be also illustrated along with their common pitfalls. After taking this course students will be able to prepare their own data set for the following analysis and to choose the most appropriate among the available statistical methods to evaluate background values, trends or statistical differences in their data. At the course participants will learn to address questions such as geographical distribution of communities, interactions between communities and their physical environment, ecological change through time in response to sudden or gradual environmental change (pollution, climate), and patterns of diversity. **First part** Introduction to the course and to data that will be used. Brief overview on case studies/sampling conditions. The use of statistics: what is statistics and why is it needed; planning surveys, experiments and collecting data; types of data. Descriptive statistics: Finding the average (mean, median, mode); standard deviation, variance and standard

	error; degrees of freedom and coefficient of variation; descriptive statistics. Processing and presenting data: Displaying whole data sets; displaying summarised data; presenting data The normal distribution and data transformations: How to know if data are normally distributed. Introduction to hypothesis testing **Second part** Analysing frequencies: Chi-square test, goodness of fit and contingency tables. Confidence intervals and comparisons of two sample means: parametric vs. non-parametric tests; paired vs. non-paired tests; comparing means with equal or unequal variance; t-tests When to use non-parametric statistics: Mann-Witney U-test; Wilcoxon test; Kruskall-Wallis test; non-parametric statistics; Introducing analysis of variance: One-way and two-way ANOVAs; post-hoc tests; randomised block design, repeated measures design, analysis of covariance design Correlation, covariance and the correlation coefficient; Pearson product moment correlation coefficient; coefficient of determination; Spearman rank correlation coefficient. Regression analysis: Simple linear regression; residuals, confidence intervals, transformation of axes; reduced major axis regression. ANOVAs and General Linear Models; introduction to multivariate statistics
Evaluation: YES/NO	*YES*
Calendar	*II semester*