

| Applied Statistics for Scientific Research | | | |
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| Number of CFU 4 | Activities | Lectures | 18 (hours) |
| | | Laboratory | 10 (hours) |
| | | Seminars | 4 (hours) |
| | | Other activities (please indicate the activity) | (hours) |
| <p><u>Objectives</u> The priority course is intended to provide students with an applicative framework of statistics and with skills for the development of an experimental design, the study of data and the characterization of the samples, the selection of the appropriate statistical test, the validation of hypotheses and the presentation of results. As a supplement to lectures, the training activity will involve intensive laboratory work, the approach to case-studies of data analysis and the biological interpretation of the results. The course will propose the managing of software and web-based tools for statistical analysis of data with particular attention to the interpretation of the resulting statistics. The topics proposed in the course will be discussed in the light of the international bibliography.</p> <p><u>Learning outcome</u> The course aims to provide student with the ability to apply theoretical knowledge to the understanding of biological phenomena. The mastery of application of theoretical principals to the analysis of phenomena will allow students to develop their own critical visions. Students will have the opportunity to develop their attitude to the statistical thinking and autonomous argumentative skills to the analysis and communication of data and themes. cover both the and methods of analysis. Learning skills related to fundamental notions of applied statistics will be stimulated through exercises also aimed at verifying the effective understanding of the topics covered.</p> <p><u>Topics</u> (with the indication of the n of hours/topic) Types of data and scale of modalities (1). The experimental design, repetition, randomization and blocks, the "blind" and the "double blind", development of an experimental design (2). Theory of statistical tests and hypothesis, inference and sampling, sampling techniques (1). The distribution of variables and the distribution classes, the normal distribution, the verification of the normality of a distribution, normalization of a non-normal distribution (2). The chi-squared distribution, Student's t distribution, Fisher's F distribution (2). Student's t test and ANOVA test (2). Non-parametric tests: the sequence test, the sign test, the Wilcoxon-Mann-Whitney test, comparison of rates and proportions (2). Methods of analysis for categorical variables, 2x2 contingency tables, Fisher's exact method, KOLMOGOROV-SMIRNOV method, association measures in 2x2 tables (2). Simple linear regression (1). The multiple linear regression (1). Methods of reduction of variables (1). Grouping analysis: dissimilarity measures, classification methods, group selection criteria (1).</p> <p><u>Evaluation</u> Intermediate oral tests will be performed to verify both the learning of theoretical concepts, the ability to appropriately design an experiment, discriminate data based on their modality, choose the appropriate statistical test and correctly interpret the results.</p> <p><u>Recommended readings</u> - Irving W. Burr (1974). Applied Statistical Methods, 1st Edition. J. William Schmidt (Ed.)</p> | | | |

- D. J. Bartholomew et al. (2002). The analysis and interpretation of multivariate data for social scientists, Chapman & Hall (Eds)