Statistics in Agriculture

Prof. Maurizio Moschini

COURSE AIMS AND INTENDED LEARNING OUTCOMES

The course aims to provide students with the theoretical knowledge and tools necessary for the presentation, description and statistical processing of empirical data and the planning of experimental investigations. The analysis will involve a theoretical and practical approach through the use of IT applications.

At the end of the course, students will know and understand the basic concepts of statistics and the terminology used. They will know the processes involved in the method and design of scientific experiments and will know the experimental designs commonly used in agricultural and food sciences. They will be able to understand the differences between regression and correlation for an appropriate use, even with multiple independent variables. They will understand how to include qualitative variables in regression analysis and possess the knowledge to understand the automatic selection procedures in the development of regression models with multiple independent variables. They will know and understand non-parametric and multivariate methods, and be able to appreciate the use of applications in statistical analysis.

At the end of the course, students will be able to organise and summarise datasets through descriptive statistics and, using an inferential approach, make decisions on populations. They will be able to plan commonly used experimental designs, analyse the data obtained, including through the use of computer applications, and interpret the scientific evidence. They will be able to calculate and interpret simple and multiple regression models, and conduct logistic regressions for dichotomous or polytomous variables. They will be able to calculate and interpret commonly used non-parametric tests and understand when to use them as an alternative to parametric tests. They will be able to conduct statistical analyses with multivariate techniques and interpret the results.

COURSE CONTENT

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|  | ECTS |
| *Review of descriptive and inferential statistics* * Univariate and bivariate frequency distributions;
* Centrality measures and variability measures;
* Random variables and their distributions;
* Inference on a population (mean, variance, proportion);
* Inference on two populations.
 | 0.50 |
| The simple linear regression model and its extensions* Review of the simple linear regression model;
* Multiple linear regression and the stepwise procedure;
* Use of dichotomous variables.
 | 1.00 |
| The variance analysis model * Analysis of variance with one or more factors;
* Experimental drawings.
 | 2.5 |
| Nonparametric methods  | 0.5 |
| Multivariate methods | 0.5 |
| Tutorials | 1.00 |

READING LIST

J.H. Zar, Biostatistical Analysis, Prentice Hall, 5th ed., Englewood Cliffs, NJ, 2009.

WW Wayne, Biostatistica, EdiSES, 3rd ed., 2019.

Further supplementary reading references will be provided during the course.

TEACHING METHOD

The course includes 5 ECTS (35 hours) of lectures and 1 ECTS (12 hours) of tutorials, during which the concepts learnt in lectures will be applied and analysed using a computer application, the basic use of which will be explained during the tutorials. The ability to solve exercises, including through the use of the computer application, is fundamental for passing the exam.

ASSESSMENT METHOD AND CRITERIA

There is a final exam based on the resolution of exercises. The final exam, lasting a total of 120 minutes, involves the production and discussion of dataset analysis outputs, obtained by way of the application used during the tutorials. The exercises mainly involve applying the analysis methods discussed in lectures, but may also contain some theoretical questions. Ten marks are allotted to each exercise and the final mark is out of thirty. The assessment aims to provide a sufficiently precise measure of the student's overall level of preparation on the entire course program followed, and to help the lecturer understand both the student's reasoning ability and his/her mastery of the methodological tools taught.

NOTES AND PREREQUISITES

Basic knowledge of some concepts of probability, and of continuous and discrete distributions and their use in probabilistic calculus.

Information on office hours available on the teacher's personal page at http://docenti.unicatt.it/.