Syllabus
Course description

Course title	Advanced Statistics
Course code	46001
Scientific sector	SECS/S-02
Degree	PhD in Sustainable Energy and Technologies PhD in Mountain Environment and Agriculture PhD in Food Engineering and Biotechnology
Semester	1
Year	1
Academic year	2018/2019
Credits	3
Modular	No

Total lecturing hours	20
Total lab hours	-
Total exercise hours	-
Attendance	Yes
Prerequisites	Basic knowledge of probability and statistics
Course page	

Specific educational objectives	The course is designed for acquiring professional skills and knowledge in the area of statistics. The students will be enabled to independent treatment of statistical research issues. Data analysis of typical research problems will be done in R or SPSS.

Lecturer	Gianni Arioli
Scientific sector of the lecturer	MAT/05
Teaching language	English
Office hours	See Cockpit
Teaching assistant *(if any)*	-
Office hours	-
List of topics covered	Review of basic statistical concepts Descriptive statistics Distributions Graphical representation of data Contingency tables Hypothesis testing Analysis of variance including interaction Linear and multilinear regression Logistic regression

	Linear and quadratic discriminant analysis
	Cross-validation. Bootstrap.
	Linear model selection: subset selection, shrinkage, principal component regression and partial least squares
	Principal component analysis, clustering
Teaching format	Frontal lectures

Learning outcomes	Knowledge and understanding Knowledge of the most important statistical methods for data analysis; understanding their rationale, conditions of usage and their results. Applying knowledge and understanding Identification of appropriate statistical method for data analysis; independent identification and application of functions in statistical package R. Making judgements Critical reviewing of own scientific work and of original publications; interpretation of statistical analyses in the context of diverse scientific fields. Communication skills Ability to present results of statistical analyses correctly and intelligibly. Learning skills Ability to recognize situations in which statistical analysis is necessary. Ability to judge the appropriateness of statistical methods.
Assessment	Collaboration in exercises
Assessment language	English
Evaluation criteria and criteria for awarding marks	

Required readings	Teacher's slides in the electronic reserve collection.
Supplementary readings	Ross, Sheldon M., Introduction to probability and statistics for engineers and scientists, 3rd ed., Amsterdam et al.: Elsevier Academic Press James, Witten, Hastie, Tibshirani. An Introduction to Statistical Learning with Applications in R, Springer 2013, freely available at http://www-bcf.usc.edu/~gareth/ISL/index.html