UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze della Terra e del Mare
ACADEMIC YEAR	2017/2018
MASTER'S DEGREE (MSC)	NATURAL SCIENCES
SUBJECT	STATISTICS FOR EXPERIMENTAL AND TECHNOLOGICAL RESEARCH
TYPE OF EDUCATIONAL ACTIVITY	B
AMBIT	50509-Discipline chimiche, fisiche, matematiche ed informatiche
CODE	11598
SCIENTIFIC SECTOR(S)	SECS-S/02
HEAD PROFESSOR(S)	SOTTILE GIANLUCA Ricercatore a tempo Univ. di PALERMO determinato
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	102
COURSE ACTIVITY (Hrs)	48
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	1
TERM (SEMESTER)	2° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**SOTTILE GIANLUCA** Monday 10:00 12:00 Ufficio del docente Wednesday 10:00 12:00 Ufficio del docente

PREREQUISITES	Elements of basic statistics, elements of mathematics
LEARNING OUTCOMES	Knowledge and understanding Knowledge of methods and statistical procedures for exploratory and descriptive analysis of univariate and bivariate data. Knowledge of no-specialized and statistical softwares. Applying knowledge and understanding The student must know how to properly formulate a problem and choose the appropriate statistical and computer analysis solutions. Making judgments The student will be able to translate into statistical terms a requirement established in an ecological context. He/she must also be able to intervene with cleaning activities, reorganization, descriptive analysis and interpretation of data from different sources type, processing and communicating coherently the results of his/her observations. Communication skills The student will have the ability to highlight and define the statistical target of a study, involving also not experts, justifying the choices of the tools used for the analysis, also being able to communicate the results of analysis with appropriate language. Learning ability The student must have developed the learning skills necessary to continue the study of statistics applied to ecology by mastering the basic cultural and educational content necessary also to follow the updates of the discipline.
ASSESSMENT METHODS	A short test is given to the students to assess their individual preparation at the beginning of the course. Then both the methodologies and the modalities of the ongoing evaluation are presented. The ongoing evaluation takes place in the middle of the course. The learning evaluation is completed by an oral exam at the end of the course. Excellent (30-30 cum laude). Excellent knowledge of the topics, excellent properties of language, good analytical ability. The student is also able to apply his/her knowledge to solve all proposed problems Very good (26-29). Good mastery of the topics, full property of language. The student is able to apply his/her knowledge to solve proposed problems. Good (24-25). The student reached a basic knowledge of the main topics, discrete properties of language, with limited ability to independently apply the his/her knowledge to the solution of the proposed problems. Satisfactory (21-23). The student does not have full mastery of the main topics of teaching, but it possesses the knowledge, satisfactory property language, poor ability to independently apply the acquired knowledge. Sufficient (18-20). The student has a minimum basic knowledge of the main topics and technical language issues, very little or no ability to independently apply the acquired knowledge. Insufficient - The student does not have an acceptable knowledge of the contents of the topics covered in the course.
EDUCATIONAL OBJECTIVES	The course aims to provide the basic elements useful for the study of ecological systems through statistical means. The statistics analyzes quantitatively the phenomena whose study requires the observation of a series of individual events. In particular, the methods generally used and particularly appropriate for the study of complex ecological systems, for which the application of standard procedures represents a limit, will be introduced. The workshop activities will expect the use of statistical software R
TEACHING METHODS	Classroom lectures and exercises
SUGGESTED BIBLIOGRAPHY	Domenico Piccolo "Statistica", edizione il Mulino; Samuel M. Scheiner e Jessica Gurevich "Design and Analysis of Ecological Experiments", Chapman & Hall; Angelo M. Mineo "Una guida all'utilizzo dell'ambiente statistico R", (http://cran.r-project.org/doc/contrib/Mineo-dispensaR.pdf) Materiale didattico fornito dal docente

SYLLABUS

Hrs	Frontal teaching
6	Introduction to Statistics. Definitions and terminology. measurement scales and character classification. Synthesis of a series of statistical data: frequency distributions. Measures of central tendency. Introduction to the R statistical software. Exercises on the frequency distributions and on measures of central tendency.
6	Indices of absolute and relative variability. Skewness and kurtosis indexes. Graphical representations. Multivariate frequency and corresponding summary measures and graphical representations. Exercise with the R statistical software
6	Introduction to probability theory: classical definition, frequentist and axiomatic. Conditional probability and Bayes theorem. Exercise on the calculation of probabilities.

SYLLABUS

Hrs	Frontal teaching
6	Definition of random variable and distribution function. Definition of expected value and variance. Main discrete and continuous random variables: Bernoulli distribution, discrete uniform, binomial, Poisson, continuous uniform, Gaussian, and chi-square. Random variables resulting from the Gaussian distribution. Tutorial on discrete and continuous random variables.
6	Introduction to inferential statistics. Statistical sampling significant and relative sampling distributions. Definition of point estimators and corresponding optimality criteria. Methods of moments and maximum likelihood. Exercises on point estimators.
6	Estimators interval and corresponding methods of construction. Testing of statistical hypothesis: probabilistic logic and structure of the statistical test, optimality criteria and statistical likelihood ratio test. Tutorial on interval estimators and statistical hypothesis testing.
6	The simple linear regression model: specification of the model, the least squares method and the coefficient of determination. Testing and confidence intervals for the parameters. Exercise in R on the real data set of simple linear regression analysis model.
6	Extension of the simple linear regression model: multiple linear regression and notes on logistic regression and log-linear model. Problem of model selection. Exercise in R and analyze real-world data sets.