



# UNIVERSITÀ DEGLI STUDI DI PALERMO

<b>DEPARTMENT</b>	Scienze della Terra e del Mare		
<b>ACADEMIC YEAR</b>	2017/2018		
<b>MASTER'S DEGREE (MSC)</b>	GEOLOGICAL SCIENCES AND TECHNOLOGIES		
<b>INTEGRATED COURSE</b>	ELEMENTS OF STATISTICS AND ANALYSIS OF EXTREME EVENTS - INTEGRATED COURSE		
<b>CODE</b>	19266		
<b>MODULES</b>	Yes		
<b>NUMBER OF MODULES</b>	2		
<b>SCIENTIFIC SECTOR(S)</b>	SECS-S/01		
<b>HEAD PROFESSOR(S)</b>	ADELFO GIADA	Professore Ordinario	Univ. di PALERMO
<b>OTHER PROFESSOR(S)</b>	ADELFO GIADA	Professore Ordinario	Univ. di PALERMO
<b>CREDITS</b>	6		
<b>PROPAEDEUTICAL SUBJECTS</b>			
<b>MUTUALIZATION</b>			
<b>YEAR</b>	2		
<b>TERM (SEMESTER)</b>	2° semester		
<b>ATTENDANCE</b>	Not mandatory		
<b>EVALUATION</b>	Out of 30		
<b>TEACHER OFFICE HOURS</b>	<b>ADELFO GIADA</b> Tuesday 11:00 13:00 ex DSSM secondo piano Thursday 11:00 13:00 ex DSSM secondo piano		

DOCENTE: Prof.ssa GIADA ADELFO

<b>PREREQUISITES</b>	Knowledge of the basis of maths and statistics
<b>LEARNING OUTCOMES</b>	<p>Knowledge and understanding At the end of the course, students should show knowledge and comprehension of the main topics of the course. In particular they should learn the specific language of probability theory and fundamentals of statistics, probability and extreme values theory.</p> <p>Applying knowledge and understanding students should become able to apply their knowledge and comprehension to tackle problems of uncertainty by means of suitable stochastic models. Specifically, students should be capable to: -summarize information; -interpret different forms of dependencies; -describe a random pattern with also suitable graph tools; For this point the practice lessons will be fundamental.</p> <p>Making judgments Students should become able to recognize with criticism the significant elements of a problem of uncertainty, thereby assessing the probabilistic tools used to tackle the problem. Students will take these elements during the lessons and practice, aimed at the stimulation of personal judgments .</p> <p>Communication skills Ability to explain the characteristics of statistical tools, highlighting the usefulness of their application. Classes aim also to stimulate and promote debate in the classroom, in order to provide the fluency of terminology and concepts, sometimes complex, also at conversational level .</p> <p>Learning skills Ability to read the national and international basic literature, and increase the acquired knowledge in attending higher level courses</p>
<b>ASSESSMENT METHODS</b>	<p>The exam is done through an oral interview and practice by PC. The Selection Committee will be led by the lecturer of the teaching and at least one professor or assistant professor of the same or similar subject area.</p> <p>The oral test aims to deepen learning assessment of students. This will consist in at least two questions aimed to graduate the evaluation of knowledge, skills, abilities and transversality with arguments of the courses taken previously owned by the student as well as the ability to provide this knowledge with a suitable language of statistics.</p> <p>The lab test consists in the performance of a practical example, analyzing real data in risk data contexts. The threshold of sufficiency of the oral test will be reached when the student shows knowledge and understanding of the subjects at least in the general lines (definition of concepts) and has minimal application skills, consisting of the examples of simple concrete cases. The more the student will show his/her argumentative and expository ability, as well as the property of language, the more the evaluation will be positive. For the practice, the sufficiency is related to the ability of solving real problems by proper statistical tools, using the specific software. The final evaluation of the exam will take in consideration three main aspects: i) the mastery of the subjects; ii) the ability in applying the knowledge iii) the property of language. The Commission will grade each appearance according to the mode "None"; "Poor", "Fair", "Good", and "Great." The teacher will take into account also some examination contextual factors (such as active participation in class and exercises, or the presence of some disability) and the general performance (extent of vocabulary, knowledge of statistical terms)</p>
<b>TEACHING METHODS</b>	The course will be organized in frontal and practice classes.

**MODULE  
PRINCIPLES OF STATISTICS**

*Prof.ssa GIADA ADELFFIO*

**SUGGESTED BIBLIOGRAPHY**

Mood A. M., Graybill F. (1988) Introduzione alla Statistica. McGraw&Hill, Borra, Di Ciaccio, Statistica 3<sup>a</sup> ed., McGraw-Hill. Capp 1-6.  
R Manuals. <http://cran.r-project.org/manuals.html>

<b>AMBIT</b>	21015-Attività formative affini o integrative
<b>INDIVIDUAL STUDY (Hrs)</b>	47
<b>COURSE ACTIVITY (Hrs)</b>	28

**EDUCATIONAL OBJECTIVES OF THE MODULE**

The course aims to provide the basic elements useful for analyzing in quantitative terms the phenomena through the observation of a set of individual manifestations.

In particular, methods will be introduced to analyze both the characteristics of a population and those related to the random nature of the observations, leading the student to the knowledge of the basic methodologies of statistical inference and the ability of applying such methodologies to statistical analysis issues.

Through the techniques of statistical inference, it will clarify the need to determine a probability function, referring to the whole population, which also specifies the probability that a generic fixed value will be exceeded. In particular, for every random phenomenon the student must be able to justify any used probability distributions and provide the most common synthesis values, also assessing the probability of events (conditional and not). At the end of the course, the student will be able to identify the methods and techniques appropriate to the analysis and apply them, summarizing the results in the most effective way.

Laboratory hours will be held in labs by the software R.

**SYLLABUS**

<b>Hrs</b>	<b>Frontal teaching</b>
4	Statistics and basic introduction (Frequencies, table and graphs, position measures and variability);
4	Double frequency distribution: marginal and conditional distributions, correlation and regression
2	Probability: random variable; expected value and variance in a r.v. Probability distributions and Gaussian distribution
2	Likelihood
4	Main inferential approaches and hypothesis assessment and prediction
<b>Hrs</b>	<b>Workshops</b>
4	Introduction to R
2	Distributions: means and variability
2	Joint distribution of two variables and regression
4	Statistical Inference

**MODULE  
ANALYSIS OF EXTREME EVENTS**

*Prof.ssa GIADA ADELFO*

**SUGGESTED BIBLIOGRAPHY**

Stuart Coles (auth.) An Introduction to Statistical Modeling of Extreme Values 2001  
R Manuals. <http://cran.r-project.org/manuals.html>

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**EDUCATIONAL OBJECTIVES OF THE MODULE**

The purpose of this module is to illustrate some of the main statistical techniques for analyzing univariate extreme events, including: model based on the generalized distribution for extreme events (GEVs) and models based on point processes.

The importance of these models lies in their utility for the description of extreme natural events, both for the ability to characterize phenomena through the parameters of appropriate model for extreme values and to estimate the return times corresponding to particularly serious extreme events. Emphasis will be given to the main statistical methodologies for the analysis of extreme values, with particular reference to methodologies that will be used for real data.

**SYLLABUS**

<b>Hrs</b>	<b>Frontal teaching</b>
4	Elements of the theory of extreme values: Gumbel theory- Inference for the GEV distribution
2	Methods for max. blocks
2	Pareto Generalized distribution
4	Estimating return periods of extreme values
4	Point process and Poisson process for extreme events
<b>Hrs</b>	<b>Workshops</b>
4	Inference for the distribution of extreme events
4	graphical tools for the assessment of the gev model
4	estimate of the return period of extreme values starting from hydrological and seismic data