UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Matematica e Informatica
ACADEMIC YEAR	2019/2020
BACHELOR'S DEGREE (BSC)	MATHEMATICS
SUBJECT	STATISTICS
TYPE OF EDUCATIONAL ACTIVITY	C
AMBIT	10709-Attività formative affini o integrative
CODE	06644
SCIENTIFIC SECTOR(S)	SECS-S/01
HEAD PROFESSOR(S)	ADELFIO GIADA Professore Ordinario Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	94
COURSE ACTIVITY (Hrs)	56
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	3
TERM (SEMESTER)	2° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**ADELFIO GIADA** Tuesday 11:00 13:00 ex DSSM secondo piano Thursday 11:00 13:00 ex DSSM secondo piano

DOCENTE: Prof.ssa GIADA ADELFIO

PREREQUISITES	Differential and integral calculus in one and more variables. Combinatorics. Limits and series. Optimization. Basic concepts of probability theory.
LEARNING OUTCOMES	Knowledge of basic methods of descriptive and inferential statistics. Acquisition of language and terminology of the discipline. Understanding of derivations, theoretical properties and relations among the presented methods. Ability to specify the relevant statistical model and inferential procedures to achieve. Ability to deal with concrete problems with the methods acquired during the lectures. Ability to use the statistical environment R to apply the skills students have acquired during the lectures and to check via simulation the theoretical results. Being able to critically understand characteristics, potential and limits of descriptive and inferential statistical methods. Being able to frame a specific inferential problem in the broader context of the discipline. Being able to discuss the characteristics of a given problem, from the descriptive and inferential point of views. Being able to use the statistical terminology and the formalization of the problems in writing. Being able to see the scientific literature; ability to learn the patterns of extensions studied in class; learning ability of specialized statistical software also different from that used in the classroom.
ASSESSMENT METHODS	The final examination will consist of a discussion, and it is subordinated on the fact that the student had passed the written test. Written test The written test aims at detecting the knowledge and skills possessed by the student and their ability to use them in a written test that also takes into account the property of the statistical language possessed. The written test will cover topics of descriptive and inferential statistics with the support of a PC and the statistical software R, it will last a maximum of three hours, and it will consists of five questions (divided into three sub-points each) on practical and theoretical. The test will be passed if the student: i) in the case of a practical question, will be able to use the appropriated statistical methodology although spoiled by mere calculation error (as long as consistent with the same methodology); ii) will be able to, in the event of a theoretical question, the correctly answer the question even if not exhaustively. The sufficiency threshold (equal to a score of 18 on a scale of 18/30 is reached i) in the case of a practical question, in the application of the appropriate statistical methodology even if it is spoiled by the mere computation error (even if it is consistent with the methodology itself); ii) in the case of theoretical question, in the consistency of the answer, albeit not exhaustive of the topic. Oral examination The oral test is intended to dig up the topic of the written test and to evaluate the knowledge of the students on the subject. This will consist of at least two questions aimed at graduate better assessment of knowledge, skills and abilities possessed by the student, and its ability to provide it with a suitable statistical language. The test may also consist in the development of a practical example. The oral test will be passed when the student has shown knowledge and understanding of the subjects at least in general terms (definition of concepts) and have minimal application expertise, consistent in simple concrete cases (typically related to the topics covered in the initial course). The more the candidate has successfully passed the test in progress, the written test and gave evidence in the oral test, the more the assessment is positive. Final score The final evaluation of each exam will take into consideration three aspects: i) mastery of the topics; (Ii) the ability to apply knowledge and (iii) language skills, assessed throughout the written and oral test. The teacher will also have the opportunity to take into account the context factors of the exam (such as active participation during lessons and laboratory, or the presence of some disabilities) for the purpose of determining the final score. Both tests (written and oral) are evaluated on a scale of 30. The resulting vote is given by the arithmetic mean of the wrtitten and oral tests: - excellent (30 - 30 e lode): excellent command of the arguments and language skills,very good analytical skills and ability to apply the acquired knowledge; - very good (26 - 29): very good command of the arguments and language skills, ability to apply the acquired knowledge; - good (24 - 25): knowledge of the main arguments, discrete language skills, satisfying ability to apply the acquired knowledge; - acceptable (21- 23): not complete command of the main arguments, acceptable language skills, sufficient ability to apply the acquired knowledge; - passing (18 - 20): basic knowledge of the main arguments and limited language skills, limited ability to apply the acquired knowledge. - poor: lack of understanding of basic subjects, limited knowledge of the course program.
EDUCATIONAL OBJECTIVES	The course aims to guide the student to the knowledge of the basic methods of descriptive and inferential statistics and the acquisition of the ability to apply

	these methodologies to real cases. To this end, the class gives the basic theoretical concepts of descriptive statistics and the basic technical tools needed to address the inferential problems. Consistently with its institutional nature and the need to maintain a reasonable teaching load, the course will mainly focus on the concepts of the maximum likelihood. Particular attention is paid to acquisition of the terminology of the discipline, to the ability to specify the appropriate statistical model and to implement inferential procedures necessary to deal with real datasets.
TEACHING METHODS	The course will be divided into lectures and practicals. All the theoretical arguments developed during the lectures will be addressed in terms of application, by means of computer-statistical practice, with the use of the program environment R. This environment will be mainly explained during the practicals hours time.
SUGGESTED BIBLIOGRAPHY	- Casella, and Berger. Statistical inference. Vol. 2. Pacific Grove, CA: Duxbury, 2002. - Espa, Micciolo e Giuliani. Statistica, l'arte e la scienza d'imparare dai dati, Dickson, Pearson, 2015. - Arboretti, Negri, Petrucci e Salmaso. Analisi statistica dei dati per l'ingegneria, strumenti e applicazioni in R, Pearson, 2015. Eventuale materiale didattico (dispense e lucidi) forniti dal docente. - Borra e Ciaccio. Introduzione alla Statistica Descrittiva, McGraw, 1996. Testi di utile consultazione e approfondimento: - Mood, Graybill, and Boes. Introduzione alla Statistica, McGraw Hill, 1996. - Azzalini. Inferenza statistica: Un'introduzione basata sul concetto di verosimiglianza (II ed). Springer & Verlag, 2001. - Muggeo V., Ferrara G. Il linguaggio R: concetti introduttivi ed esempi, scaricabile dal sito http://cran.r- project.org/doc/contrib/nozioniR.pdf

SYLLABUS

Hrs	Frontal teaching
4	Introduction to descriptive statistics, statistical scale of measurments, graphic and tabular representations.
4	Mean and variability indicators
4	Association between qualitative and quantitative variables
4	simple linear regression model
6	Introduction to statistical inference: Basic concepts and definitions. The parametric Probabilistic-Statistical model. Likelihood and related quantities. Main parametric inferential procedures: specification of the model, point and interval estimation, hypothesis testing, prediction
4	Point estimation: Properties of point estimators: bias, consistency, efficiency. Asymptotic and exact distribution. Methods for deriving point estimators.
4	Hypothesis tests: introductory concepts, simple and composite hypothesis, statistical test, critical region, type 1 and 2 error, power test, method for deriving statistical tests.
4	Interval estimation: confidence interval and estimator; properties. Methods for deriving interval estimators. Differences between point and interval estimators.
4	Regression model: point estimation, interval estimation, hypothesis tests.
2	Residual analysis and individual diagnostics in linear models

Hrs	Workshops
2	Introduction to R and descriptive statistics in R
4	Graphics and descriptive statistics. ML and other methods for estimating unkown parameters
2	ML estimation and property of estimators in R
4	Interval estimation and test assessment with simultations
4	Linear model in R: estimation and disgnostics