UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze Economiche, Aziendali e Statistiche
ACADEMIC YEAR	2016/2017
MASTER'S DEGREE (MSC)	STATISTICAL SCIENCE
SUBJECT	NON PARAMETRIC STATISTICAL METHODS
TYPE OF EDUCATIONAL ACTIVITY	B
AMBIT	50606-Statistico
CODE	16475
SCIENTIFIC SECTOR(S)	SECS-S/01
HEAD PROFESSOR(S)	ABBRUZZO ANTONINO Professore Associato Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	108
COURSE ACTIVITY (Hrs)	42
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	1
TERM (SEMESTER)	2° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**ABBRUZZO ANTONINO** Monday 15:00 17:00 DSEAS secondo piano stanza 222

DOCENTE: Prof. ANTONINO ABBRUZZO

PREREQUISITES	Elements of probability and inferential statistics. Hypothesis test theory. Generalised linear models.
LEARNING OUTCOMES	Knowledge of basic methods of nonparametric statistics. Acquisition of language and terminology of the discipline. Understanding of derivations, theoretical properties and relations among the presented methods. 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 nonparametric and semiparametric statistics. Being able to frame a specific problem in nonparametric terms. Being able to discuss the characteristics of a given problem. Being able to use the statistical terminology and the formalisation 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 specialised statistical software also different from that used in the classroom.
ASSESSMENT METHODS	The final examination will consist of a discussion, and it depends on the fact that the student had passed both the test in progress and the written test. Students will be informed during classroom time and via e-mail, at least two weeks before the session dedicated to the test in progress starts. The test in progress and also the written tests strive to establish the knowledge, skills, abilities possessed by the student. The test in progress will concern the deepening of a theoretical topic addressed in the first part of the course. It will be an oral presentation in which the student must demonstrate the addressed topic (with the support of slide) and highlight any theoretical and practical issues studied about subject. The teacher will assemble groups of students and will guide them to the choice of the topic and in the process of structuring the slide. Each member of the group will have to answer questions on the presented topic which will be addressed both by the teacher and their colleagues. The written test will cover the non-parametric verification of parametric and semi-parametric concepts, acquired during the course, through the study of a real dataset. The teacher, formed working groups, will guide them to the choice of the data set and in how to structure the report. Each member of the group will have to answer the questions of the teacher during the final interview. 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. The final evaluation of each examination will consider three aspects: i) the mastery of the subjects; ii) the ability of applying the knowledge and iii) the properties of using an appropriate language, assessed as a whole of the test in progress, written test and oral one. The student will be evaluated as "Insufficient "; "Poor", "Fair", "Good" and "Excellent ". Therefore, the assessment method will be: Insufficient: if at least two "Insufficient" and no " Excellent " 18-20: if at least two "Poor" and no " Excellent " 21-24: if at least two "Good" and no " Excellent " 25-27: If the first "Excellent" 28-30: if two "Excellent" 30 cum laude: if three "Excellent" The range of the vote will allow the teacher to take into account for the examination of others factors such as active participation in lessons and exercises, or the presence of a disability.

	Evaluation is expressed in thirtieths. Notes: Students who have passed the test in progress will keep valid the test until the end of the academic year. If within this deadline, the student will not have passed the exam, it will have to start over.
EDUCATIONAL OBJECTIVES	The course aims to guide the student to the knowledge of the basic methods of non parametric statistics and the acquisition of the ability to apply these methodologies to real datasets. Students should be able to understand both positive and negative aspects of nonparametric and semiparametric statistics respect to the parametric ones; use these techniques to investigate 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 applications, by means of computer-statistical practice, with the use of the program environment R.
SUGGESTED BIBLIOGRAPHY	Nonparametric Hypothesis Testing: Rank and Permutation Methods with Applications in R Stefano Bonnini, Livio Corain, Marco Marozzi, Luigi Salmaso, 2014. Density Estimation for Statistics and Data Analysis - B.W. Silverman. Statistics and Applied Probability, London: Chapman and Hall, 1986. Kernel smoothing - M.P. Wand and M.C Jones. Statistics and Applied Probability: Chapman and Hall, 1995. Generalised additive models. An Introduction with R. S.N. Wood. Statistical Science: Chapman & Hall, 2006. Eventuale materiale didattico (dispense e lucidi) forniti dal docente.

SYLLABUS

Hrs	Frontal teaching
4	Introduction to nonparametric statistics. Nonparametric hypothesis test: Kolmogorov-Smirnov, Anova.
10	Univariate kernel density: Histogram, statistical properties and methods to select the number of bins. Kernel density and their statistical properties. Choice of h. Variable kernel and their properties.
6	Multivariate kernel density: Multivariate kernel estimator and choice of H. Propeties of multivariate estimator: AMISE.
10	Nonparametric regression: Cubic splines and penalized spline regression. Augmented objective function. Choice of the smoothing parameter. Generalised additive models and methods to obtain estimation of the regression parameters.

Hrs	Practice
2	Nonparametric hypothesis test and their application to real dataset.
2	Univariate kernel density estimators and their applications to real datasets.
4	Multivariate kernel density estimators and their applications to real datasets.
4	Semiparametric and nonparametric regressions and their applications to real datasets.