



# UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze Economiche, Aziendali e Statistiche
ACADEMIC YEAR	2022/2023
MASTER'S DEGREE (MSC)	STATISTICS AND DATA SCIENCE
SUBJECT	BIostatISTICS
TYPE OF EDUCATIONAL ACTIVITY	B
AMBIT	50607-Statistico applicato
CODE	16444
SCIENTIFIC SECTOR(S)	SECS-S/05
HEAD PROFESSOR(S)	ATTANASIO MASSIMO    Professore Ordinario    Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	9
INDIVIDUAL STUDY (Hrs)	162
COURSE ACTIVITY (Hrs)	63
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	1
TERM (SEMESTER)	2° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	<b>ATTANASIO MASSIMO</b> Wednesday 10:00    12:00    dseas ed 13 studio 104

<b>PREREQUISITES</b>	Knowledge of the methods of classical statistical inference (as required by Statistica 2 STAD); of inference on Linear Models (as required by Statistica 3 STAD). Knowledge of survival analysis (as required by Statistica Sociale 2 STAD); ability to use the statistical programming environment R and Sas at intermediate level.
<b>LEARNING OUTCOMES</b>	<p>Knowledge and understanding (Conoscenza e capacita' di comprensione)  The student has to acquire i) a technical language typical of biostatistics that will be useful to read scientific papers and books and to communicate suitably with experts (doctors, biologists, etc.); ii) proper statistical methods devoted to the analysis of medical data; iii) the ability to distinguish among different ways to acquire data.</p> <p>Applying knowledge and understanding (Capacita' di applicare conoscenza e comprensione)  The student has to be able i) to distinguish among different data typologies (individual or aggregate; longitudinal or single-spell); ii) to distinguish among different surveys (perspective, longitudinal, observational, and retrospective); to detect suitable statistical methods related to data type and survey.</p> <p>Making judgements (Autonomia di giudizio)  The student has to be able to i) comment/report on medical/epidemiological study results in a statistical way; ii) discriminate between pros and cons of several statistical methods and techniques in medical and clinical studies.</p> <p>Communication skills (Abilita' comunicative)  The student has to be able to i) present technical reports adopting an adequate language according to the audience; ii) write "the statistical methods" for any scientific medical paper section.</p> <p>Learning skills (Capacita' d'apprendimento)  The student has to be able to i) search in the national and international scientific statistical literature in medical field; ii) adapt his/her knowledge to the needs of the "client"; iii) use his/her knowledge to solve new problems.</p>
<b>ASSESSMENT METHODS</b>	<p>Student's assessment is done through an oral and a written test.  The exam will be conducted by the regular teacher, and at least one among teachers/PhDs of similar study field or experts approved by the Degree Course Committee.</p> <p>The written test is in English. The oral test will normally be held in English. The teacher may, if he/she deems it appropriate, have the candidate present one or more topics in Italian. Oral exam will examine in depth the test and further student's knowledge.</p> <p><b>WRITTEN TEST</b>  The written test aims to check student's knowledge and abilities and his/her talent in reporting them in a text along with an adequate statistical language. Test duration is at the most 3 hours and the student can use an A4 sheet, containing his/her notes for the exam. It considers: 2 open questions (at most 3 sub-questions for each question), both practical and theoretical. Questions will be formulated in order to be easy understandable, clear, with different difficulty, and with results easily comparable among students. Sufficiency will be reached when the student will show a basic use of the core concepts/terms of the course, and i) the application of the suitable methodology even in case of mere calculus errors, for the practical question; and ii) a basic (not fully argued) answer statistically coherent to the theoretical question.</p> <p><b>ORAL EXAM</b>  Once the student passes the written test, he/she will access to the oral exam. Oral exam consists of at least 2 questions aimed at refining the assessment of the student's knowledge and abilities (also the ability to connect to others subjects) and his/her talent in reporting them in an oral presentation. Questions could regards a practical example. Sufficiency will be reached when the student will show a basic use of the core concepts/terms of the course, and i) the application of the suitable methodology even in case of mere calculus errors, for the practical question; and ii) a basic (not fully argued) statistically coherent answer to the theoretical question. Better he/she will perform, higher will be the assessment.</p> <p><b>FINAL MARK</b>  Final mark will consider of the outcomes of both written test and oral exam and English language performance, taking into account: i) mastery of course topics; ii) ability in applying knowledge. Marks range is used in order to give the examiners some degree of discretion in taking into account some student context characteristics (disability, or level of participation during lessons). Final passing mark for course is in [18; 30].</p>
<b>EDUCATIONAL OBJECTIVES</b>	The primary objective of the course is the acquisition of statistical skills in order to: 1. Provide general guidance for the design of a clinical trial, 2. processing and analyzing data from medical and health care studies. The student will be incendio: 1. know how to process and analyze survival data according to Functional the Cox PH scheme; 2. Apply and knowing advantages and disadvantages of several extensions of this model (models with

	discrete time; stratification; competing risks models, models with time-dependent variables), 3. know the "philosophy" of the meta-analysis, treating the most common statistical tests (P and Q, funnel plot) knowing how to apply simple statistical methods for assessing the combinability of studies in meta-analysis.
<b>TEACHING METHODS</b>	Front class teaching, computing lab tutorials.
<b>SUGGESTED BIBLIOGRAPHY</b>	-Collett D. (1994), Modelling survival data in medical research (ch. 1, 2,3 e 4), Chapman & Hall. -Klein-Moeschberger (1997), Survival Analysis, ch.8 e 9 Springer -Willett, Singer (2003), Applied Longitudinal Data analysis, Oxford University Press (ch.10 and 11) - Putter, H., Fiocco, M. and Geskus, R. B. (2007), Tutorial in biostatistics: competing risks and multi-state models. Statistics in Medicine, 26: 2389–2430 Sections 1;2,3.1,3.2,3.3;3.3.1. -Borenstein et.al. (2009), Introduction to Meta-analysis pp1-115 , Wiley - Fleiss J. (1981), Statistical Methods for Rates and Proportions, Wiley ch.13, Sections 13.1 e 13.2

## SYLLABUS

<b>Hrs</b>	<b>Frontal teaching</b>
2	Introduction. Description of training aims, and examination.
2	Survival data: discrete and continuous data. Survival, hazard, cumulative hazard, life expectation functions.
4	Kaplan Meier, Nelson Aalen and actuarial estimators. Interval and point hazard. The log rank test. Semiparametric methods: graphical methods and test for proportionality, Cox model, how to build the partial likelihood function, how to choose a model, meaning of the estimated parameters, of the baseline and of survival function.
14	Extensions of the Cox model: time discrete models; stratification, time dependent variables; time effect variables; multi state models; competitive risks model.
4	Simple agreement measures between raters. Cohen's K
4	Screening tests. Roc curves
6	Meta-analysis (random and fixed models, funnel plot, assessing covariate imbalances)
<b>Hrs</b>	<b>Practice</b>
4	Cox model. R and SAS Software
4	agreement. Cohen's K
11	Extensions of the Cox model. Software: R and SAS
4	Screening Tests. RoC curves
4	Meta-analysis