Course Title	Advanced Methods in Epidemiology and Biostatistics				
Course Code	PHE705				
Course Type	Compulsory				
Level	Doctoral (3rd cycle)				
Year / Semester	1st Year/1st Semester				
Teacher's Name	TBA				
ECTS	10	Lectures / week	3/14	Laboratories / week	NA
Course Purpose and Objectives	The purpose of this course is to explore and integrate concepts and methods in biostatistics as applied in epidemiology that are key to the conduct of public health research. Students will develop a critical understanding of biostatistical methods and how they inter-relate with epidemiology, rather than treating different statistical methods as separate topics. Emphasis is placed on understanding the proper application of epidemiological and statistical methods. Epidemiologic topics including threats to the validity of a study design (e.g. bias, misclassification, confounding, effect modification), causal inference, problems of exposure and disease definitions and time-dependent effects, use of large databases for research and predicting outcomes are explored. Advanced statistical methods including, generalized linear models, survival analysis, multilevel models and Bayesian hierarchical models are also addressed. Finally, modern statistical methods in public health such as Bayesian spatiotemporal models with Geographic Information Systems (GIS), interrupted time series models and latent variable models are also analyzed. Course objectives are achieved through active learning and a combination of lectures, statistical practical sessions and seminars specifically for coursework exercises, or the review and discussion of journal articles highlighting various aspects of the design, analysis or interpretation of studies.				
Learning Outcomes	Upon successful completion of this course students should be able to: • Explain epidemiological concepts, such as person, place and time to describe the distribution and determinants of disease • Apply different measures of disease occurrence and association, and calculate rates and risks • Assess the relevance, and understand the limitations, of various analytical study designs for the analysis of disease causation, the assessment of effectiveness of clinical interventions, and the distribution and general impact of health services • Address threats to the validity of study design, including bias, misclassification, confounding, and effect modification				

	• Distinguish between basic methods for selecting samples and understand the impact of the sampling method on the choice of statistical analysis and generalizability of results • Appraise and explain the statistical methods used in public health • Choose and apply statistical methods for each analytical epidemiological study design and data type • Choose and then apply an appropriate regression model, and interpret the results from this model, for the analysis of individually and frequency matched case-control studies, cohort studies, cross-sectional surveys, and cluster-randomized trials, using appropriate computer software • Explain when individual observations are not independent, and how to account for this in the statistical analysis of specific epidemiological studies by using methods that account for correlation • Plan a strategy of analysis to answer an epidemiological research question, using an appropriate choice and order of statistical analyses to control for confounding and account for interaction, informed by a causal inference framework • Interpret properly the results and findings of the statistical methods		
Prerequisites	N/A	Required	N/A
Course Content	The course content is developed in a way to relate the statistical methods with epidemiological study design as follows: **Study designs in analytical epidemiology** Describing data with diagrams and summary measures of location and variance, estimating confidence interval for a population mean and the difference and ratio of two population parameters **Randomized Control Trials** Independent and paired samples t-test, repeated measured Analysis of Variance (ANOVA), two-way mixed ANOVA, Analysis of Covariance (ANCOVA), non-parametric statistical tests **Cohort study designs** Chi2 test, Correlation, Linear regression, Logistic regression, Poisson regression, Generalized Additive Models, Random effect model, Multilevel generalized linear models, Generalized Additive Model, Bayesian hierarchical models, Survival Analysis, Kaplan-Meier estimates of survival curves, Mantel-Haenszel test, Cox proportional hazards regression **Case-control study designs** Conditional logistic regression **Ecological study design** Bayesian spatial models and Geographic Information Systems, Interrupted time series regression for the evaluation of public health		

	interventions, Cluster Analysis, K-means Clustering, Latent Variable and Factor Analysis
Teaching Methodology	Face to face
Bibliography	Plichta, S. and Kelvin E. Munro's Statistical Methods for Health Care Research. 6th Edition. J. B. Lippincoltt Company, 2013 Xinguang, C. and Ding-Geng, C. Statistical Methods for Global Health and Epidemiology: Principal, Methods and Applications, Springer, 2020 Field A. Discovering Statistics Using IBM SPSS Statistics. 5th Edition, Sage Publishing, 2018 Bowers D. Medical Statistics from Scratch: An Introduction for Health Professionals. 3rd Edition. Wiley-Interscience, 2014
Assessment	Assignments 60% Exams/Presentations 30% Class Participation and Attendance 10% 100%
Language	Greek/English