Dottorato in Metodi Matematici e Statistici per le Scienze Economiche e Sociali

Probability Theory: definitions and concepts; conditional probability and independence; Bayes theorem; calculus of probabilities.

Random variables: definitions; expectations; mean and variance*; moments and moment generating functions**; common families of distributions; *exponential families*; location and scale families**.

Multiple random variables: joint, marginal and conditional distributions; independence; covariance and correlation; *most common families of multiple random variables**.

Some properties of probability distributions: joint distribution of two random variables; Student's *t* and Fisher's *F* distribution; linear transformations of random variables; *most common inequalities and identities**.

Convergence concepts: *laws of large numbers*, central limit theorems*, different types of convergence**.

Properties of random samples: basic concepts of random samples; *different approaches to statistical inference**; statistics based random samples; sampling from the normal and Bernoulli distribution; *principles of data reduction*: sufficiency, likelihood and invariance principles***.**

Point and interval estimation: methods of finding estimators; methods of evaluating estimators; confidence intervals; confidence interval for: the mean of a normal and of a Bernoulli population, the difference of the means of two normal or Bernoulli populations, the variance of a normal population; confidence intervals for large samples.

Hypothesis testing: methods of finding tests; methods of evaluating tests; testing hypothesis for: the mean and of a normal and a Bernoulli population, the difference of the means of two normal or Bernoulli populations, the variance of a normal population; *large samples tests*; robustness of tests*; elements of nonparametric tests**.

Linear regression model: simple linear regression model: interpretation of the model; point and interval estimation of the parameters**;** testing hypothesis on the

parameters; *multiple regression model*: point and interval estimation of the parameters**;** testing hypothesis on the parameters.*

References:

Casella G. Berger R.L. (2002). Statistical Inference. Seconda Edizione. Wadsworth & Brooks Cole. Cap 1-9, Sec. 10.1, 11.2, 12.1.