STATISTICS

Code: 12308

Main Scientific Area: Statistic

Lecturer: Estela Maria dos Santos Ramos Vilhena

Language of Instruction: Portuguese

Regime: S1

Contact Hours: 60h Total Workload: 40h

ECTS: 4,0

Objectives

Every aspect of daily life is related to the observation and treatment of quantitative data, and therefore with the application of statistical methodologies. This situation finds often deficient and even dangerous responses and interpretations, frequently due to the lack of adequate theoretical and methodological knowledge. Thus, the statistical work has to be to help plan, obtain, analyze and interpret the data and present the results in order to summarize the information and facilitate the decision-making. It becomes essential to discover patterns and extract knowledge from sample data and to infer to the population. The course is intended to sensitize the students to the importance of the correct resolution of real problems that nowadays.

Learning Outcomes

Skills to develop: distinguish between population and sample; organize and summarize data from statistical studies; identify and classify variables; decide which measures can be used in different situations, their advantages and disadvantages; create and interpret graphs; understand fundamental concepts of probability; identify the most important probability distributions; estimate and interpret population unknown parameters; perform, interpret and make decisions based on confident intervals and hypothesis tests. Identify variables that affect a given response by using correlations and simple regressions.

Course Contents

Introduction. Objectives. Descriptive Statistics and Inferential Statistics. The Statistical Method. Descriptive Statistics. Sample and population. Different types of data. Measurement scales: nominal, ordinal, interval and scale. Data presentation: charting and graphing. One-dimensional distributions. Frequency distribution of discrete and continuous variables. Observed and cumulative frequencies. Graphical representation of frequency distributions. Differential and integral diagrams. Histogram. Parameters and statistics. Measures of location. Arithmetic mean, median and mode. Quantiles. Measures of dispersion. Interquartile range. Mean absolute deviation, variance and standard deviation. Coefficient of variation. Measures of skewness and kurtosis. Boxplot. Normal Distribution. Relationship between standard deviation, interquartile range and outliers in data approximately normal. Probability Theory. Random experience. Probability spaces. Sample space. Events. The axioms the theory of probability. Conditional probabilities. Total probability theorem and Bayes' theorem. Independence of events. Incompatible events. Random variables. Distribution function. Discrete and continuous random variables. Probability and probability density functions. Parameters of random variables. Theoretical distributions. Binomial Distribution. Hypergeometric distribution. Poisson distribution. Normal or Gaussian distribution. Central Limit Theorem. Probability plots, Q-Q Plot and P-P Plot. Sampling methods. Random and nonprobability samples. Simple random, systematic, stratified and cluster sampling. Convenience and quota sampling. Estimation. Point estimation. Estimator and estimate. Properties of estimators. Confidence intervals. Definition and interpretation. Confidence intervals for means, proportions and variances. Hypothesis testing. Null hypothesis and alternative hypothesis. Simple and composite hypothesis. Unilateral and bilateral tests. Inference errors. Relationship between the two types of errors. The significance level. Power of the test. Methodology. Statistic test. Decision rule. P-value.Relationship between

confidence intervals and hypothesis testing. Normality tests. Correlation and simple linear regression: Scatterplot. Pearson's correlation coefficient. Coefficient of determination

Recommended Bibliography

A. Hall, C. Neves, A. Pereira: Grande Maratona de Estatística no SPSS, Escolar Editora, 2011

CAST, Computer-Assisted Statistics Textbooks, http://cast.massey.ac.nz/collection_public.html R

eis, E.; Melo, P.; Andrade, R.; Calapez, T. (2001); “Estatística Aplicada” – Vol 1 e 2, 4ª Ed, Edições Sílabo

A. Robalo: Estatística – Exercícios – Vol 1 e 2, Edições Sílabo

Learning and Teaching Methods

The presentation of practical examples using appropriate software, together with the presentation of dynamical and interactive graphs anddiagrams, enables a permanent discussion in the classroom, allowing students to acquire the skills and achieve the desired objectives: motivate the students towards problem resolution that nowadays tend to have a global scope and that just can be explained and solved applying an holistic perspective, providing students with the control of the main quantitative methodologies and techniques in the treatment and analysis of data and inference from these.

Assessment Methods

The student will be assessed by:

two partial tests (TP1 and TP2);
practical/group work (TG) (written and oral component);

The final grade (NF) will be given by

NF=30%T1+40%T2+30%TG

The practical work must be carried out by working groups of between 3 and 4 people.

Work: 15% written component + 15% oral component

The grade for the oral component may vary between members of the same group!!!

The practical work is MANDATORY for continuous assessment and examination!!!

NOTE

The minimum mark for the 2nd test is 7;
The minimum mark for the written component of the assignment is 8 ;