COURSE DATA

Data Subject	
Code	34286
Name	Biostatistics
Cycle	Grade
ECTS Credits	6.0
Academic year	2021 - 2022

Study (s)

Degree	Center	Acad. year	Period
1207 - Degree in Optics and Optometry	Faculty of Physics	1	Second term

Subject-matter

Degree	Subject-matter	Character
1207 - Degree in Optics and Optometry	2 - Mathematics	Basic Training

Coordination

Name	Department
CORRECHER VALLS, JUAN FRANCISCO	130 - Statistics and Operational Research

SUMMARY

Biostatistics is an instrumental topic, with a basic character to analyze experimental data. It is a complement of the rest of topics related with Mathematics and also experimental in the Optical and Optometric's Degree.

Also it is present with the same name or the similar one of Statistics in other degrees inside the field of Health Sciences like Medicine, Dentistry, Biology and Pharmacy.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

It is not needed an additional knowledge to the Mathematics taught at the Secondary School.

COMPETENCES (RD 1393/2007) // LEARNING OUTCOMES (RD 822/2021)

1207 - Degree in Optics and Optometry

- To apply the general methods of Statistics to Optometry and Vision Sciences.
- To know how to discriminate the objectives of a statistical analysis: purely descriptive and inferential.
- To know the principles and applications of statistical contrasts or hypothesis tests.
- To know the general principles of probabilistic models and in particular of regression models and analysis of variance.

LEARNING OUTCOMES (RD 1393/2007) // NO CONTENT (RD 822/2021)

The student will be able to compute probabilities associated to random events using known probabilistic models, also he will be able to model random experiments using random variables. The student will know the foundations of Statistical Inference (estimation and hypothesis testing). He will be able to solve the hypothesis contrasts like comparison of means and proportions, including some non-parametric methods. He can understand the basic data analysis, including regression analysis, with the statistical treatment and its processing with a statistical computer program.

DESCRIPTION OF CONTENTS

1. Statistics in the Health Sciences.

Objectives and usage of Statistics. Populations and samples. Probability as a foundation of Statistics. Examples.

2. Statistical variables

Types of variables. Graphic representations: Bar graphs. Box plots. Histograms. Stem-and-leaf plots. Box and whiskers diagrams. Numeric representations: frequency tables, measures of centralization, position, dispersion and shape.

3. Probability foundations

Concept and interpretations of probability. Conditional probability. Total probability theorem. Bayes theorem. Applications.

4. Random variables: Generalities.

Definition and kind of variables. Probability distributions: distribution function, probability mass function and density. Parameters of a random variable: location and spread measures.

5. Remarkable probability distributions

Discrete distributions: Bernouilli, Binomial i Poisson. Continuous distribucions: Uniform, Normal. Central Limit Theorem. Aproximations with the normal distribution.

6. Statistical Inference

Sampling distributions. Population parameters: point estimation and by intervals. Hypothesis contrast. Types of errors. Significance and P-value. Distribution of the sample mean in the sampling. Confidence intervals. T test for the mean. Applicability of methods. Normality tests. T tests for the difference of means. Non-parametric tests. Analysis of variance.

7. Linear regression and correlation

Linear relationship between two variables Scatter plots. Basic statistics. Fit of a regression line. The regression model. Inference of the parameters of the linear model. Correlation and determination coefficients. Interpolation prediction. Influential values. Validation of methods.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	45,00	100
Computer classroom practice	15,00	100
Study and independent work	30,00	0
Preparation of evaluation activities	15,00	0
Preparation of practical classes and problem	45,00	0
TOTAL	**150,00**	

TEACHING METHODOLOGY

In the theoretical lectures the set of lessons is developed, with presentations and in the blackboard representative exercises are solved, that which show the most important aspects of the lesson. The slides used are available in Aula Virtual. In the tutorials in group, a set of exercises will be solved, emphasizing same basic aspects of learning and solving doubts. The practical classes are taught in the computers room, in seasons of two hours or two hours and a half and using a statistical package to analyze data files. The manual of each practice session will be available in Aula Virtual. Also a collection of exercises for each lesson is given to the student, with the solutions, for individual or in group work.

EVALUATION

The final grade for the course is the sum of the grade obtained in the following three blocks:

-B1. Theoretical-practical exam consisting of the reasoned resolution of exercises and problems, as well as the interpretation of a number of outputs of the statistical software used in the course. The total value of this part will be up to 6 points.

-B2. Exercises developed in the practical sessions. The total value of this part will be up to 3 points.

-B3. Attendance, participation and use of the practical sessions. The total value of this part will be up to 1 point. It is necessary to attend a minimum of 80% of the practical hours in order to obtain a grade higher than zero in this block.

A pass will be obtained with a final grade of 5 or higher.

Blocks B2 and B3 are not recoverable, since their evaluation is only possible during the teaching period in the practical sessions.

REFERENCES

Basic

- 10.1 Referencias Básicas

Referencia b1: Samuels, M.L. and Witmer, J.A. Statistics for the Life Sciences. (3rd. Ed.) Pearson Education Inc. (2003).
Referencia b2: Martínez-González, M.A., Sánchez-Villegas, A., Faulín Fajardo, J. Bioestdística Amigable (2ªed.) Díaz de Santos (2006).
Referencia b3: Milton, J.S. Estadística para Biología y Ciencias de la Salud. (3ª ed.) Madrid McGraw-Hill Interamericana (2001).

Additional

- 10.2 Referencias Complementarias

Referencia c1: Chase, W. & Brown, F. General Statistics. (2nd ed.) Wiley (1992).
Referencia c2: Norman, G.R y Steiner, D.L. Bioestadística. Madrid: Mosby/Doyma Libros (1996).
Referencia c3: David M. Diez, Christopher D. Barr, Mine Çetinkaya-Rundel OpenIntro Statistics (2nd ed.) pdf gratis disponible en openintro.org (2013).
Referencia c4: Rosner, B. Fundamentals of Biostatistics (7th ed.) Brooks/Cole, Cengage Learning (2010).
Referencia c5: Cobo, E. Bioestadística para no estadísticos. Elsevier-Masson. (2007).

ADDENDUM COVID-19

This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council

TEACHING METHODOLOGY

In the event that the health situation requires a hybrid teaching model, the teaching modality approved in the Academic Degree Committee in a session of July 20, 2020 will be adopted, which consists of 100% presence of the students in all activities, but with a classroom capacity of 50% in theory classes.

If a total reduction in attendance is required, then the synchronous videoconference modality would be used, given at the time set by the subject and the group, during the period determined by the Health Authority.