COURSE DATA

DATA SUBJECT

Code: 34286
Name: Biostatistics
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1207 - Degree in Optics and Optometry	Facultat de Física	1	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1207 - Degree in Optics and Optometry	Mathematics	BASIC

COORDINATION

GIMENEZ PALACIOS IVAN

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 / LEARNING OUTCOMES

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 general principles of probabilistic models and in particular of regression models and analysis of variance.

To know the principles and applications of statistical contrasts or hypothesis tests.

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. Random variables. Probability distributions: distribution function, probability and density functions. Uniform, binomial and normal distributions.

4. Statistical Inference: one sample

Sampling distributions. Population parameters: point and interval estimation. Hypothesis testing. Types of errors. Significance and P-value. Sampling distribution of the sample mean. Confidence intervals. T-test for the mean. Applicability of the methods. Normality test. Wilcoxon nonparametric test.

for the difference of means. Wilcoxon nonparametric test for the difference of medians. Conditions of applicability. Levene's test for equality of variances. Analysis of variance for more than two samples (one-factor ANOVA). Welch's test. Kruskal-Wallis test. Post-hoc analysis and determination of sets with

5. Statistical Inference: two and more samples

homogeneous mean.

6. Statistical inference: categorical variables

Point and interval estimation of one proportion. Hypothesis testing for one proportion. Goodness of fit. Chi-squared test. Contingency table. Homogeneity test. Independence test. Applicability conditions. ODDS ratio. Fishers test.

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

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	45,00
Computer classroom practice	15,00
Total hours	**60,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	0,00
Independent study and work	30,00
Preparation of lessons	45,00
Preparation for assessment activities	15,00
Resolution of case studies	0,00
Total hours	**90,00**

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 two blocks, all evaluable out of 10 points.

B1. Theoretical-practical exam consisting of the reasoned resolution of exercises and problems, as well as the interpretation of different outputs of the statistical software used in the subject. The minimum grade to pass this part is 4.0 points.

B2. Exercises developed in the practical sessions. The minimum grade to pass this part is 4.0 points.

The final grade (P) of the first call will be the result of applying the following formula: P = 0.6 B1 + 0.4 B2. Passing will be obtained with a final grade of 5 or higher.

In the second call, the written exam B1 is taken, but B2 obtained in the first call are kept. The formula for the calculation of the final grade is also kept.

REFERENCES

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

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