



# DEGREE CURRICULUM

# **BIOSTATISTICS**

Coordination: VILAPRIÑO TERRE, ESTER

Academic year 2021-22

## Subject's general information

|   |   |               |                        |
|---|---|---------------|------------------------|
| <b>Subject name</b>   | BIOSTATISTICS   |               |                        |
| <b>Code</b>   | 101505  |               |                        |
| <b>Semester</b>   | 2nd Q(SEMESTER) CONTINUED EVALUATION                    |               |                        |
| <b>Typology</b>   | <b>Degree</b>   | <b>Course</b> | <b>Character</b>       |
|   | Bachelor's Degree in Biomedical Sciences                | 2             | COMMON                 |
|   | Master's Degree in Biomedical Research                  |               | COMPLEMENTARY TRAINING |
| <b>Modality</b>   | Attendance-based  |               |                        |
| <b>Course number of credits (ECTS)</b>  | 6   |               |                        |
| <b>Type of activity, credits, and groups</b>                                    | <b>Activity type</b>                                    | <b>PRAULA</b> | <b>TEORIA</b>          |
|   | <b>Number of credits</b>                                | 3             | 3                      |
|   | <b>Number of groups</b>                                 | 2             | 1                      |
| <b>Coordination</b>   | VILAPRIÑO TERRE, ESTER                                  |               |                        |
| <b>Department</b>   | BASIC MEDICAL SCIENCES                                  |               |                        |
| <b>Teaching load distribution between lectures and independent student work</b> | At Class 60 hours . At Home 90 hours                    |               |                        |
| <b>Important information on data processing</b>                                 | Consult <a href="#">this link</a> for more information. |               |                        |
| <b>Language</b>   | English<br>Catalan<br>Spanish                           |               |                        |
| <b>Distribution of credits</b>  | Theoretical classes 50%<br>Seminars 50%                 |               |                        |

| Teaching staff            | E-mail addresses        | Credits taught by teacher | Office and hour of attention |
|---------------------------|-------------------------|---------------------------|------------------------------|
| TEJADA GUTIERREZ, EVA LUZ | eva.tejada@udl.cat      | 6                         |                              |
| VILAPRIÑO TERRE, ESTER    | ester.vilapriño@udl.cat | 3                         |                              |

## Learning objectives

Statistical techniques are essential to verify whether the available data allow to verify the working hypotheses in any observational or experimental study. In this course, understanding that it is an introductory raw, we set ourselves the main objectives:

- To understand the concept of variability and its influence on the evaluation of results.
- To understand the concept of statistical significance of a result.
- To learn to pose a statistical analysis using the R program Understand and know how to use basic statistical models.
- To be able to make a basic statistical analysis based on the work objectives in each case.

## Competences

- To be able to understand and critically evaluate biomedical literature in relation to design, statistical analysis and interpretation of results, as well as knowing how to interpret confidence intervals and statistical significance.
- To be able to design simple studies and analyze and interpret the results according to the objectives set.
- To be able to use the R program to perform statistical analyzes.
- To understand the importance of statistics within the scientific method.
- To understand the importance of statistical evidence in the generalization of results of experiments and observational studies.
- To understand the importance o

### Specific skills

CE13. Critically evaluate the biomedical literature in relation to design, statistical analysis and interpretation of results, as well as know how to interpret risk and association measures, confidence intervals and statistical significance.

CE14. Design simple studies and analyze the results according to the proposed objectives.

### Basic skills

CB1 That students have demonstrated that they have and understand knowledge in an area of study that is based on general secondary education, and is usually found at a level that, while supported by advanced textbooks, also includes some aspects that involve knowledge from the forefront of their field of study

CB2 That students know how to apply their knowledge to their work or vocation in a professional way and possess the skills that are usually demonstrated through the development and defense of arguments and problem solving within their area of study

### General Competences

CG5 Apply the gender perspective to the tasks of the professional field

f design in planning a study.

## Subject contents

1. **Statistics, Data, and Statistical Thinking**
2. **Descriptive Statistics and Looking Data**
3. **Study Designs**
4. **Probability, Bayes' Rule**
5. **Probability Distributions**
6. **Statistical Inference**
7. **P-values**
8. **Statistical Tests**

9. Linear Regression Analysis and Analysis of Variance (ANOVA)
10. Logistic Regression

## Methodology

In the theory classes the basic concepts will be raised and the technical aspects necessary to make a good analysis of the data will be worked on. The analysis procedures with the R program will be introduced and application examples will be discussed.

In the seminars, concrete examples will be analyzed, emphasizing the use of R as an analysis tool. The practical sessions, with the exception of the first three, are organized around specific projects that will address the issues to be resolved by the student regarding the methods and procedures of the subject. Students must develop the analysis of several projects and submit reports that will be evaluated. R is a statistical analysis program of great power and free distribution that runs on any platform.

## Development plan

|   |  | Total | Theory | Practice |
|---|--|-------|--------|----------|
| 1 | From research goals to data: Study Designs   | 3     | 3      |          |
| 2 | Clues from Looking at Data: Descriptive statistics   | 6     | 2      | 4        |
| 3 | Understanding probability: Bayes' Rule and clinical diagnostic. Probability Distributions: reference intervals in clinical data. Clinical tests. | 8     | 4      | 4        |
| 4 | About risk factors: analyzing frequencies. Understanding risk ratio and odds ratios.   | 4     | 4      |          |
| 5 | Statistical thinking: confidence intervals. Interpretation and limitations.  | 6     | 4      | 2        |
| 6 | Statistical modelling: linear regresion.   | 8     | 4      | 4        |
| 7 | Statistical modelling: experimental design.  | 8     | 4      | 4        |
| 8 | Statistical modelling: logistic regression.  | 8     | 4      | 4        |
| 9 | Statistical modelling: survival analysis.  | 8     | 4      | 4        |

## Evaluation

- 1st Exam 20% **NO recovery exam**
- 2nd Exam 45% If the grade is less than 5, it is mandatory to take a recovery exam.
- Final work 25%
- Seminars 10%

In order to pass the course, a minimum of 5 in the second examis required (either in the first attempt or in the recovery phase).

Changes in the development and evaluation of the course will be indicated in the resources section of the virtual campus depending on the conditions imposed by the SARS-COV-2 pandemic.

## Bibliography

### Basic:

- Daniel WW. (1995) Bioestadística: base para el análisis de las ciencias de la salud. México: UTEMA.
- An Introduction to R. W. N. Venables, D. M. Smith and the R Core Team. <https://cran.r-project.org/doc/manuals/r-release/R-intro.pdf>

### Complementary:

- Bland M (2000). An introduction to medical statistics, 3rd ed. Oxford: Oxford University Press.
- Altman DG. (1990) Practical statistics for medical research. Chapman & Hall/CRC; 1st ed.
- Gonick L, Smith W. The cartoon guide to statistics. HarperCollins Publishers, Inc. New York, 1993.

### Additional:

- The notes and materials that must be worked during the course will be deposited in the Resources folder of the Virtual Campus.