Teaching guide

IDENTIFICATION DETAILS

Degree:	Biomedicine
Scope	Biology and Genetics
Faculty/School:	Experimental Sciences
Course:	BASIC BIOSTATISTICS
Type:	Compulsory
ECTS credits:	4
Year:	1
Code:	2132
Teaching period:	First semester
Subject:	Statistics
Module:	Experimental Methodology in Biomedicine
Teaching type:	Classroom-based
Language:	Spanish
Total number of student study hours:	100

SUBJECT DESCRIPTION

Statistics is the science that collects, classifies, summarizes, finds regularities, analyzes and makes inferences from information in order to carry out predictions and make decisions. Biostatistics is the branch of statistics applied to research in all areas of the life sciences where variability is the rule.

The scientific method uses experimentation as one of its most important tools. In this sense, statistical methods are essential when it comes to providing rigor and verisimilitude to experimental methods and to the conclusions drawn from them.

The subject of Statistics in Biomedicine has an eminently applied nature, where the most theoretical aspects use mathematical language. This subject is a basic tool in those subjects where the student must collect, present or

analyze experimental data or data from direct observation of experiments and clinical trials related to Biomedicine. In the same way, it is a very important tool for critically analyzing scientific articles and publications related to Biomedicine.

As a result of the Biostatistics course, it is intended that Biomedicine students, when carrying out the empirical study of what they observe on a daily basis and, in particular, in their research practices, understand and know the basic concepts of Biostatistics that allow them to deepen and understand the scientific basis of their area of work. It is a matter of generating a critical attitude towards any scientific reading, acquiring a common language with statisticians and other professionals in the field and knowing a priori the essential steps and elements in any empirical research that relies on the management of a significant volume of data and whose ultimate purpose is to condense this information so that it can be transmitted and extrapolated the conclusions to the populations under study. It is important to highlight that there is no research if there are no previous objectives: what has not been proposed cannot be ruled out or affirmed. Regardless of the student's future dedication to research, an important part in the transmission of new findings and knowledge in the area of health sciences is based on statistical language. That is why students must be absolutely familiar with this terminology so that they can have a critical and objective attitude when reading any scientific literature. The critical and ethical sense in the analysis and presentation of one's own data and in the interpretation of others is another of the relevant points that will be worked on during the course of this subject, with the objective of providing comprehensive training.

GOAL

The final objective of the course is for the student to know the principles and postulates of statistics and to be able to use them to organize information, analyze it and extract value for decision-making in the field of health sciences. In this context, it is intended that the student knows the potential of statistical techniques in the search for truth within experimental sciences while being able to identify their limits. That he learns to communicate and interpret the results in scientific and technical publications. It is also intended that students learn to discriminate human (service to the common good), technical (relevance within the area of knowledge) and statistical values from the results of a study and to be able to weigh these values in decision-making.

The specific aims of the subject are:

Understand and use the tools of mathematics to understand both theoretical and experimental processes and data.

Train students in the interpretation of statistical results and their value for decision-making in health sciences.

Design, analyze and interpret simple statistical studies.

Know and be able to use specific software for statistical analysis, as well as to know the format for entering data in it.

Develop a critical capacity that allows us to communicate, but also to evaluate and interpret scientific studies in which random phenomena come into play.

Understand and evaluate scientific studies based on statistical analysis.

To train professionals who are fluent in solving basic problems with quantitative and/or discrete variables.

PRIOR KNOWLEDGE

The student must have a level of knowledge of Mathematics equivalent to the level reached in the 2nd year of high school.
User-level knowledge of basic computer tools (especially in the use of spreadsheets).
Knowledge of English with an average reading comprehension level is recommended.

COURSE SYLLABUS

The contents of the course are structured in the three blocks detailed below:
Block 1. Descriptive Statistics
Topic 1. Introduction to statistics. Sampling, types of variables and frequency tables.
Theme 2. Measures of central tendency.
Theme 3. Position, dispersion and shape measurements.
Topic 4. Graphical representations of statistical data.
Topic 5. Evaluation of diagnostic tests.
Theme 6. Risk assessment.
Topic 7. Simple linear correlation and regression.
Block 2. Probability
Topic 8. Fundamental concepts of probability.
Topic 9. Combinatorial analysis.
Topic 10. Application of probability in the health sciences.
Topic 11. Random variables.
Topic 12. Discrete random variable distributions.
Topic 13. Distributions of continuous random variables.
Block 3. Statistical Inference
Topic 14. Sample distributions and confidence intervals.
Topic 15. Point and interval estimators.
Topic 16. Contrast of hypotheses.
Topic 17. Fisher-Snedecor analysis of variance (ANOVA) and F distribution.

EDUCATION ACTIVITIES

The teaching-learning methodology consists of a series of face-to-face work activities and others that the student must carry out autonomously.
FACE-TO-FACE ACTIVITIES
AFP1. Expository class: Master classes given by the teacher in which the contents of the subjects are presented.
AFP2. Practical classes: exercises and practical cases and experimental work carried out in the classroom or in the computer laboratory.
AFP3. Presentation of group work: Written presentation and/or oral presentation in class of work done individually or in teams.
AFP4. Tutoring: Through tutoring, the teacher, at the request of the student and at the established time for this

purpose, will answer questions or discuss the questions posed to him by the student, in order to guide him in learning the subject.
AFP5. Evaluation: carrying out evaluation tests.
NON-FACE-TO-FACE ACTIVITIES
AFNP1. Theoretical study: Study of the theoretical-practical contents of the programs of the subjects of the module. Use of complementary materials designed in virtual networked spaces.
AFNP2. Preparation of practical classes and/or group work.
AFNP3. Problem solving.
AFNP4. Tutoring preparation: Preparation of the issues to be raised and discussed in the tutorials.

DISTRIBUTION OF WORK TIME

TEACHER-LED TRAINING ACTIVITIES	INDIVIDUAL WORK
45 Horas	55 Horas

LEARNING RESULTS

Critically evaluate and use sources of clinical and biomedical information to obtain, organize, interpret and communicate information from the various areas that constitute biomedicine.

Understand the design of experiments based on statistical criteria and the various tools available for data processing in the area of life and health sciences.

Know and apply epidemiological foundations and statistical procedures in the study of human health and disease to ensure the reliability and robustness of the results of biomedical research.

SPECIFIC LEARNING RESULTS

Describe when, how and why the statistical techniques studied are used. Solve the problems posed with these techniques.

Interpret, analyze and communicate statistical information

Apply the knowledge acquired in the analysis of own data or data collected in articles and publications of interest

Critically analyze the available statistical information

Generate conclusions from the analyzed statistical information to produce competent decisions

Use computer programs effectively and with skill to solve statistical problems

Describe, quantify, analyze and critically evaluate the results obtained from the work experimental carried out in a

laboratory

Share the need for ethical and professional standards

LEARNING APPRAISAL SYSTEM

The proposed ORDINARY EVALUATION SYSTEM is described below, with the statistical weight and conditions for each of the parts of the evaluation process:

BLOCK THEORY
Evaluation of the theoretical content of the subject through oral and/or written tests with development, short answer or test-type questions (65%). Oral and/or written exams will be taken to evaluate the learning of the contents presented in theoretical, practical and teamwork classes based on cooperative learning. The exams will consist of practical case and problem solving exercises with which the student will demonstrate their knowledge and understanding of the subject, as well as their ability to apply what they have learned. In the middle of the semester, a partial-non-elimination exam will be held, which will have a value of between 10-15% of the final grade for those students who pass the grade set by the teacher. This grade will be fixed later (always prior to the completion of this exam) and will be in the range [6.5-7.5]. In order to ensure the minimum knowledge necessary for the student to continue their training under optimal conditions in subsequent years, a minimum score of 5.0 will be scored in the exams in this section in order to be able to apply the statistical weights and therefore to be able to pass the subject.

CLASSROOM WORK BLOCK
Evaluation of attendance, participation and contribution in face-to-face classroom activities (10%). The way in which the student actively and collaboratively participates in face-to-face sessions will be evaluated, providing reflections, resolving doubts, working as a team and contributing to the development of the proposed activities.

COOPERATIVE WORK BLOCK.
Evaluation of teamwork based on cooperative learning (25%). At this point, the way in which the student performs in cooperative learning will be evaluated, both in the presentation of written documents and in their oral defense. The course will be approved when the final grade obtained, after applying the statistical weights of each part, is equal to or greater than 5 (out of 10). If any student does not exceed the minimum grade required in the Theory or Cooperative Work blocks in the Ordinary Call, they will not be able to pass the subject in said Call and must recover those part (s) in the Extraordinary Call.

ALTERNATIVE EVALUATION SYSTEMS
The evaluation system for students who enroll for the second time or later in the subject will be exactly the same as for first-time students. If there are any students with an academic exemption, they should contact the subject teacher to find out about the evaluation criteria provided for their particular case.

IMPORTANT NOTE
Plagiarism, as well as the use of illegitimate means in evaluation tests, will be sanctioned in accordance with the university's Evaluation Regulations and Coexistence Regulations.

ETHICAL AND RESPONSIBLE USE OF ARTIFICIAL INTELLIGENCE

1.- The use of any Artificial Intelligence (AI) system or service shall be determined by the lecturer, and may only be used in the manner and under the conditions indicated by them. In all cases, its use must comply with the following principles:
a) The use of AI systems or services must be accompanied by critical reflection on the part of the student regarding their impact and/or limitations in the development of the assigned task or project.
b) The selection of AI systems or services must be justified, explaining their advantages over other tools or methods of obtaining information. The chosen model and the version of AI used must be described in as much detail as possible.
c) The student must appropriately cite the use of AI systems or services, specifying the parts of the work where they were used and describing the creative process followed. The use of citation formats and usage examples may be consulted on the Library website(https://www.ufv.es/gestion-de-la-informacion_biblioteca/).
d) The results obtained through AI systems or services must always be verified. As the author, the student is responsible for their work and for the legitimacy of the sources used.
2.- In all cases, the use of AI systems or services must always respect the principles of responsible and ethical use upheld by the university, as outlined in the Guide for the Responsible Use of Artificial Intelligence in Studies at UFV. Additionally, the lecturer may request other types of individual commitments from the student when deemed necessary.
3.- Without prejudice to the above, in cases of doubt regarding the ethical and responsible use of any AI system or service, the lecturer may require an oral presentation of any assignment or partial submission. This oral evaluation shall take precedence over any other form of assessment outlined in the Teaching Guide. In this oral defense, the student must demonstrate knowledge of the subject, justify their decisions, and explain the development of their work.

BIBLIOGRAPHY AND OTHER RESOURCES

Basic

Murray R. Spiegel; translation by Rafael Hernández Heredero; technical review by Lorenzo Abellanas Rapun. Statistics/2nd ed. Madrid [etc.] :McGraw-Hill, D.L.1992.
(Murray R. Spiegel; translation by Rafael Hernández Heredero; technical review by Lorenzo Abellanas Rapun. Statistics/2nd ed. Madrid [etc.] :McGraw-Hill, D.L.1992. , ||Cesar Perez Lopez. Statistics: Solved Problems and Applications/Madrid: Pearson Education, 2003.)

V. Quesada Paloma, A. Isidoro Martin, L. A. López Martín. Statistics course and exercises: application to biological, medical and social sciences/Madrid:Alhambra, 2005.
(V. Quesada Paloma, A. Isidoro Martin, L. A. López Martín. Statistics course and exercises: application to biological, medical and social sciences/Madrid:Alhambra, 2005. , ||José Olarrea Busto, Marta Cordero Gracia. Statistics: 45 useful problems/Madrid: García-Maroto, 2007.)

Additional

Dereck Rowntree Statistics Without Tears: An Introduction for Non-Mathematicians 1

F. J. Martin Pliego, L. Ruiz-Maya Perez. Foundations of Probability/3rd ed. Madrid:Paraninfo, 2018.

Ciro Martínez Bencardino. Applied basic statistics/5th edition. Bogota: Ecoe Ediciones, 2019.

Ruiz-Maya, Luis. Foundations of Statistical Inference/3rd ed. Madrid:AC,2004.
(Ruiz-Maya, Luis. Foundations of Statistical Inference/3rd ed. Madrid:AC,2004. , ||María Josefa Peralta Astudillo... [et al.]. Statistics: solved problems/Madrid:Pirámide, D.L. 2000.)