

## 28403 - Epidemiology and biostatistics

### Syllabus Information

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**Academic Year:** 2020/21

**Subject:** 28403 - Epidemiology and biostatistics

**Faculty / School:** 105 - Facultad de Veterinaria

**Degree:** 451 - Degree in Veterinary Science

**ECTS:** 6.0

**Year:** 1

**Semester:** Annual

**Subject Type:** Compulsory

**Module:** ---

## 1.General information

### 1.1.Aims of the course

**The subject and its due results answer to the following expositions and targets:**

The exposition in this subject departs from the situation of need that is created before a scientific study of realizing a correct epidemiologic and statistical data analysis. The better and the more rigorous is the epidemiologic and statistical study that we realize, the greater quality of the research work will be

The general aim therefore is, from the experimental results and the formulation of a hypothesis, to be able of obtaining the scientific thesis endorsed by a correct epidemiologic and statistical study.

### 1.2.Context and importance of this course in the degree

The subject Epidemiology and Biostatistics is a compulsory and it is integrated by two subjects given by academic staff from two different areas: Epidemiology (Area of Animal Health) and Biostatistics (Area of Applied Mathematics). Also this subject presents the peculiarity which both subjects belong to different modules inside the Degree in Veterinary Science: Epidemiology (Clinical Sciences and Animal Health) and Biostatistics (Common Basic training). It has a teaching load of 6 ECTS (4 Epidemiology and 2 Biostatistics) and has annual character, being given during the first course of the Degree.

The contents of these two subjects are the base for a correct use of the scientific method in the context of the veterinary sciences, as well as to allow a suitable knowledge of the animal populations and diseases that affect them. In case of the subject Biostatistics, the competences defined as the Order ECI/333/2008 as Biometrics and statistics applied to the veterinary sciences and Dynamics and demography of the infection and the poisoning are specially developed, while in Epidemiology the competences are: Transmission and maintenance of the diseases and methods of study of the diseases in populations, Diagnosis Epidemiology and diagnosis, System of pursuit and alertness, The investigation of outbreaks of food toxic-infections and Dynamics and demography of the infection and the poisoning.

Due to the basic character of this subject, its overcoming must qualify the students for the pursuit of the rest of specific subjects of the qualifications.

### 1.3.Recommendations to take this course

It is advisable to have studied subjects of Mathematics and Statistics prior entering the veterinary degree, as well as a few basic computer skills.

## 2.Learning goals

### 2.1.Competences

On successful completion of this course, students will be able to:

1. Make use of a scientific reasoning, with critical character, in the analysis, synthesis and evaluation of epidemiologic models and real statisticians.
2. Apply the knowledge acquired to the analysis and search of the model that better represents a set of experimental information, and to confirm properly the above mentioned solutions.
3. Use the computer applications relative to the ambience of study.
4. Use Internet as an information source, as well as mass communication media.

5. To dominate the aspects of the communication, both oral and written.
6. To show capacity of organization and autonomous planning of the work.
7. To apply appropriately the probability distributions to the different situations observed in Veterinary Sciences.
8. To understand the mechanisms of transmission and maintenance of the disease / infection in the animal populations.
9. To design, to carry out and to analyze epidemiological studies, including sampling, measurement of disease and detection of risk factors.

## 2.2.Learning goals

If students complete the course successfully, they should be able to:

### Biostatistics

1. To describe from the statistics a set of experimental information.
2. To recognize the most habitual probability distributions in biomedical sciences.
3. To identify the probabilistic model that better fits to a set of experimental information.
4. To obtain conclusions on the statistical parameters of a population from a sample.
5. To analyze the possible regression models between two quantitative variables.
6. To use an appropriate computer hardware for solving the problems that arise in the previous paragraphs.

### Epidemiology

1. To comprise the basic elements of the qualitative epidemiology and the relations among pathogenic, host, environment and disease
2. To interpret appropriately the results of a diagnostic test in reliability terms.
3. To design and to collect samples adapted to the target of the study
4. To characterize the health status of a population
5. To identify and to assess the possible risk factors that determine the health status of an individual from a population.
6. To understand the factors that they affect to the decision making and it is capable of taking decisions of rational and objective form.

## 2.3.Importance of learning goals

These learning outcomes are keys to qualify students for a solid base that allows them to face the rest specific modules of the degree in the best conditions, and this way to shape successfully its professional profile.

Also, with laboratorial sessions, the strengthening of the generic or cross-sectional competences that they contribute to its integral formation like postgraduates, especially the work in team and the use of computer hardware are encouraged.

## 3.Assessment (1st and 2nd call)

### 3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

he student will have to demonstrate that has reached the results of learning foreseen by means of the following activities of evaluation

1. Assessment of **theoretical knowledge** and its application to a real context: It is based on the resolution of different activities on the teaching platform of the subject (multiple answers, mails, problems). First of all, key activities that cannot be assessed whose correct resolution is necessary to keep on gaining access to the activities (included theoretical documents) are included. The assessable activities are specific for every student and they are distributed in 20 topics with different individual weighting as its relevance, whose entire sum is proportional to the number of ECTS of every subject, so that in the final qualification the Biostatistics activities are 10% of the final qualification and the Epidemiology activities are 20% of the final qualification.
2. Assessment of problem solving in practical sessions: They are distributed in 10 sessions with different individual weighting as its relevancy, whose entire sum is proportional to the number of ECTS of every subject, therefore the Biostatistics activities are 6.7% and the Epidemiology activities are 13.3% of the final qualification.
3. Epidemiological study: It is a study based on the securing of samples of a (virtual) porcine development that provides information of quantitative and qualitative variables that will be analyzed in an integrated way from the epidemiologic and statistical point of view applying the methods and skills learned previously. This activity is carried out in the second half of the second semester supported by two practice sessions and it means 20% of the final qualification.
4. Written tests: Two partial examinations will be carried out corresponding to each subject. The **first partial examination** covers Biostatistic topics, there are 10 multiple choice questions and one essay-type questions and

they both are 16.7% of the final qualification The **second partial examination** covers epidemiology topics, there are 20 multiple choice questions and 4 essay-type questions, and they both are 33.3% of final qualification.

In case of wrong answers, the score of the multiple choice questions will be reduced by means of dividing 1 by the number of wrong answers. It will be necessary to obtain at least 50% of the maximum qualification in every examination. Essay type questions assess the ability to solve problems reasonably and the proper application of the basic theoretical concepts in the context of the raised problems.

Also there will be valued the participation in different voluntary activities that will be realized along course, face-to-face as non-presential. This score increment will suppose an additional maximum of 5% to the final score.

Scores corresponding to activities 1, 2 and 3 will be kept for next courses.

In order to sum the raised continued evaluation up the following table is included:

Activity	Matter	Weighting	
1. Evaluation of theoretical knowledge and its application to a real context	Epi	14.6%	21.8%
	BS	7.2%	
2. Evaluation of the problem solving in the practical meetings	Epi	8.4%	13.2%
	BS	4.8%	
3. Epidemiological study	-	15.0%	15.0%
4. Written test	Epi	33.3%*	50.0%
	BS	16.7%*	
5. Voluntary activities		5.0%**	5.0%**
<b>Total</b>		<b>100%</b>	<b>100%</b>

\* It is necessary to obtain 45% of the maximum score.

\*\* It is a question of the maximum additional punctuation for participation in voluntary activities.

#### Criteria for evaluation and levels of demand

First of all, it is necessary to bear in mind that the subject is divided in two subjects of knowledge (Epidemiology and Biostatistics), which as we will see, have its coordinated and integrated learning activities. Nevertheless, on having talked each other of subjects belonging to different modules, it is necessary to guarantee a required minimums in each subject.

The result of the global sum of the qualifications of activities of assessment will have to be equal or superior to 5, but also, as it has been indicated in the previous paragraph, in the written test of both subjects should have to obtain a minimal punctuation of 45% of the maximum possible qualification in order to average with rest of the activities.

#### Marking system:

According to the national regulation Law 1025/2003, 5th of September which lays down the European system of credits and marking system for the university degree.

0-4.9: FAIL.

5.0-6.9: PASS

7.0-8.9: GOOD (NT).

9.0-10: EXCELLENT (SB).

As the article 158 of the Statutes of the University of Zaragoza lays down, provisional grades will be displayed at least for 7 days and students will be able to review them on the date, time and place provided for that purpose.

#### Annex I: Distribution of theoretical topics for matter and relative weighting

Order	Subject	Weighting
Epi1	Type of variables and scales of measurement	0.53%
Epi2	Introduction to the Epidemiology	1.05%
Epi3	Assessment of diagnostic tests	1.58%
Epi4	Sampling	0.58%
Epi5	Qualitative Epidemiology	3.05%

Epi6	Causality	0,53%
Epi7	Epidemiologic surveys	1.05%
Epi8	Design of epidemiological studies	1.05%
Epi9	Cross-sectional observational studies	1.05%
Epi10	Longitudinal observational studis	1,05%
Epi11	Risk estimation	1.05%
Epi12	Theory of decision	1.05%
BS1	Probability Distributions	1.20%
BS2	Conditional Probability	0.60%
BS3	Frequencies	0.60%
BS4	Descriptive Statistics	0.60%
BS5	Statistical inference I: confidence intervals	0.60%
BS6	Statistical inference II: hypothesis contrast	1.20%
BS7	Statistical inference III: selection of tests of statistical contrast	0.60%
BS8	Models of interrelation and retrogression	0.60%
BS_prob	Problems of probability	0.60%
BS_inf	Problems of statistical inference	0.60%

## Annex II: Distribution of practical meetings for matter and relative weighting

<b>Practice</b>	<b>Weighting</b>		
Epi1: Diagnostic tests	1.58%		
Epi2: Calculation of sample size	1.58%		
Epi3: Stratified results	1.05%		
Epi4: Cross-sectional disease measurements	1.05%		
Epi5: Longitudinal disease measurements	1.58%		
Epi6: Risk estimation	1.58%		
BS1: Probability distributions	1.20%		
BS2: Descriptive statistics	1.20%		
BS3: Introduction to the Statistical inference	1.20%		
BS4: Interrelation analysis. Simple Linear retrogression	1.20%		
<b>Matter</b>	<b>Theory</b>	<b>Practice</b>	<b>Total</b>
Epidemiology	14.6%	8.4%	23.0%

Biostatistics	7.2%	4.8%	12.0%
<b>Total</b>	<b>21.8%</b>	<b>13.2%</b>	<b>35.0%</b>

## 4. Methodology, learning tasks, syllabus and resources

### 4.1. Methodological overview

The subject is structured in two matters blocks: Epidemiology, and Biostatistics. The lectures (teaching method) comprise 24 h of Epidemiology and 12 h of Biostatistics. The practical classes, which are given in meetings in computer classroom, comprise 12 h of Epidemiology; and 8 hours of Biostatistics.

For the lectures (teaching method), the pupils have previous access, across the teaching platform corresponding to the lesson that goes to work. So that it is important that they take the lesson read to assimilate better the class. The practical meetings will be carried out in classroom of computer science. The student must realize the steps following a script that will provide him to itself for every practice. Previously, the teacher has explained with an example each of the above mentioned steps.

### 4.2. Learning tasks

#### THEORETICAL TOPICS OF EPIDEMIOLOGY

##### **Topic Epi1: Types of variables and scales of measurement**

*Descriptors:* Quantitative and qualitative variables. Discrete and Continuous. Suitable measurements.

*Competences:* To be able to recognize the basic types of variables in a set of experimental information, as well as its possible measurement scales.

Teaching-learning activities:

- Lectures (teaching method): 1 h
- Student work: reading and comprehension of the theory, and achievement of the exercises, 1,5 h

##### **Topic Epi2: Introduction to the Epidemiology**

*Descriptors:* Historical precedents of the Epidemiology. Definition of Epidemiology. Uses of the Epidemiology. Differences between clinical medicine and epidemiology. Types of epidemiology. Examples of diseases.

*Competences:* To place to the Epidemiology in the frame of its historical evolution. To understand the Epidemiology concept. To know the targets of the Epidemiology. To be able to apply the epidemiologic method. To distinguish between Clinical medicine and Epidemiology.

Teaching-learning activities:

- Lectures (teaching method): 2 h
- Student work: reading and comprehension of the theory, and achievement of the exercises, 3 h

##### **Topic Epi3: Assessment of diagnostic tests**

*Descriptors:* Assessment of diagnostic tests: sensitivity, specificity and predictive values. Criteria for selection of diagnostic tests. Combination of diagnostic tests. Optimization of a diagnostic test. Agreement of two diagnostic tests (kappa).

*Competences:* To be capable of assessing the quality of a diagnostic test. To have objective criteria to select the diagnosis most adapted to every situation. To be capable of modifying the quality of a diagnostic test. To be capable of comparing two diagnostic tests.

Teaching-learning activities:

- Lectures (teaching method): 3 h
- Student work: reading and comprehension of the theory, and achievement of the exercises, 4,5 h

##### **Topic Epi4: Sampling**

*Descriptors:* Basic sampling concepts. Characteristics of the sample. Factors to be considered: sampling method and sample size. Types of errors (systematical and random). Mechanisms of production of biases and errors. Sampling methods: probabilistic and non probabilistic. Factors that influence the sample size. Adjustments of the sample size. Calculation of sample size (to detect disease/infection, to estimate an average, to estimate a percentage and to detect differences between percentages).

*Competences:* To know the theoretical essentials of the sampling. To be capable of selecting the most suitable sampling method. To be capable of applying the formulae of calculation of sample size.

Teaching-learning activities:

- Lectures (teaching method): 3 h
- Student work: reading and comprehension of the theory, and achievement of the exercises, 4,5 h

##### **Topic Epi5: Elements of Qualitative Epidemiology**

*Descriptors:* Temporary evolution of the disease in an individual (latency period, prepatency period and incubation period). Evolution of the disease in a population (epidemic curves, Kendall's threshold theorem, Law of Charles-Nicole, presentation

spatial- time of the disease and Epidemic Index). Determinants of disease (agent, host and environment). Transmission of the disease (infection sources, transmission mechanisms, routes of transmission and strategies of maintenance of the infection).

*Competences:* To distinguish between the different forms of temporary evolution of the disease. To be capable of integrating all the disease determinants in the context of an epidemiologic triad. To know how it is transmitted and maintains a disease in a population.

Teaching-learning activities:

- Lectures (teaching method): 2 h
- Student work: reading and comprehension of the theory, and achievement of the exercises, 3 h

### **Topic Epi6: Causality**

*Descriptors:* Introduction: Snieszko's scheme. Causal reasoning. Causality criteria: (Mill's canons, Postulates of Henle-Koch, Postulates of Hill ...). Causal models (unicausal deterministic, simple multicausal deterministic, advanced multicausal deterministic and probabilistic).

*Competences:* To understand the evolution of the concept of causality. To be capable of realizing a causal reasoning. To understand the Henle-Koch postulates and to justify its limitations. To understand the postulates of Hill and other causality criteria. To differ between the different causal models.

Teaching-learning activities:

- Lectures (teaching method): 1 h
- Student work: reading and comprehension of the theory, and achievement of the exercises, 1,5 h

### **Topic Epi7: Epidemiologic surveys**

*Descriptors:* Definition of epidemiologic survey. Forms design (questions, answers, order, format...). Databases creation. Fulfil of surveys (method of collection of information, optimization of the value of an answer, achievement of pilot survey, configuration of the work team and cross-check and treatment of the information). Ethical considerations.

*Competences:* To be capable of selecting the necessary information in an epidemiological study. To be capable of discriminating between types of variables. To be capable of designing actively a questionnaire. To be able to gather information adapted for an epidemiologic investigation by means of surveys.

Teaching-learning activities:

- Lectures (teaching method): 2 h
- Student work: reading and comprehension of the theory, and achievement of the exercises, 3 h

### **Topic Epi8: Design of epidemiological studies**

*Descriptors:* Criteria of classification of the epidemiological studies. Experimental studies (control groups, classification and blinding): advantages and disadvantages. Observational studies (cross sectional, case-control and cohorts): scheme, advantages and disadvantages. Ecological studies. Population screening.

*Competences:* To distinguish between studies as the criteria of classification. To raise the different types of studies as the looked targets.

Teaching-learning activities:

- Lectures (teaching method): 2 h
- Student work: reading and comprehension of the theory, and achievement of the exercises, 3 h

### **Topic Epi9: Cross-sectional observational studies**

*Descriptors:* Basic concepts. Reasons (index, proportion and valuation). Definition of case and population at risk. Cross-sectional measurements: morbidity or prevalence, mortality and case fatality rate. Factors that influence the calculation: diagnostic accuracy and sample size. Raw values vs specific values. Standardization of results.

*Competences:* To differ between valuation and proportion. To measure the disease in a moment of certain time. To minimize the influence of variables of confusion on having measured the disease.

Teaching-learning activities:

- Lectures (teaching method): 2 h
- Student work: reading and comprehension of the theory, and achievement of the exercises, 3 h

### **Topic Epi10: Longitudinal observational studies**

*Descriptors:* Longitudinal measurement of the disease: Prevalence (Point prevalence and Prevalence Period) and Incidences (Cumulative Incidence and Incidence Rate). Relations between parameters.

*Competences:* To quantify the disease and its evolution throughout a period of time.

Teaching-learning activities:

- Lectures (teaching method): 2 h
- Student work: reading and comprehension of the theory, and achievement of the exercises, 3 h

### **Topic Epi11: Risk estimation**

*Descriptors:* Calculation and selection of risk estimators (Prevalence Ratio, Odds Ratio and Relative Risk). Calculation of confidence intervals. Interpretation of the risk. Other estimators of effect (Attributable Risk, Ethiological fraction, Attributable

Risk of the Population and Ethiological fraction of the Population).

*Competences:* To select the risk estimator most adapted to every type of study. To calculate the most suitable risk estimator and to interpret the risk according to the design of study, selected risk estimator and its confidence interval. To know other estimators of interest related to the risk.

Teaching-learning activities:

- Lectures (teaching method): 2 h
- Student work: reading and comprehension of the theory, and achievement of the exercises, 3 h

### **Topic Epi12: Theory of decision**

*Descriptors:* Decision under certainty (Mathematical Programming). Decision under risk: With experimentation (statistical inference) and without experimentation (Bayesian probability): Expected utility. Causes of illogical decisions. Necessary number to Treat. Decision under uncertainty (Theory of Games).

*Competences:* To understand the different possible situations on having taken a decision. To apply the rules of Bayesian decision using epidemiologic results.

Teaching-learning activities:

- Lectures (teaching method): 2 h
- Student work: reading and comprehension of the theory, and achievement of the exercises, 3 h

## **THEORETICAL TOPICS OF BIOSTATISTICS**

### **Topic BS1: Probability distributions**

*Descriptors:* Probability. Random variable: types and classification. Distribution of probability of a random variable. Discrete and continuous probability distributions in veterinary sciences. Other fundamental distributions in statistical inference.

*Competences:* To be able to recognize the most of the random variables used in veterinary sciences and its probability distributions.

Teaching-learning activities:

- Lectures (teaching method): 2 h
- Student work: reading and comprehension of the theory, and problem solving: 3 h

### **Topic BS2: Conditional probability**

*Descriptors:* Conditional probability. Concept of independence of random variables. Bayes Theorem. Application to the interpretation of a diagnosis.

*Competences:* To understand and to apply the concept of conditional probability. To recognize the independence between variables. To apply the Bayes theorem to the solving of real problems.

Teaching-learning activities:

- Lectures (teaching method): 1 h
- Student work: reading and comprehension of the theory, and problem solving: 1.5 h

### **Topic BS3: Frequencies**

*Descriptors:* Frequency. Frequency Tables. Frequency tables for grouped and ungrouped data. Graphical Representation of Frequency Distribution.

*Competences:* To be able, from a set of information, to obtain the frequency tables that describes the statistical distribution of the data base.

Teaching-learning activities:

- Lectures (teaching method): 1 h
- Student work: reading and comprehension of the theory, and problem solving: 1.5 h

### **Topic BS4: Descriptive statistics**

*Descriptors:* Descriptive statistics. Descriptive measures for a sample data. Moments measures (central tendency, variability and shape), and position measures (percentiles).

*Competences:* To be able to obtain and to interpret with the suitable computer free software the descriptive measurements of a set of sample data.

- Teaching-learning activities:
- Lectures (teaching method): 1 h
- Student work: reading and comprehension of the theory, and problem solving: 1.5 h

### **Topic BS5: Statistical inference I: confidence intervals**

*Descriptors:* Definition of statistical inference. Sampling distribution of a given statistic based on a random sample. Obtaining a probability interval from the sampling distribution. Confidence intervals. Calculation of the confidence intervals most representative or used in the veterinary sciences.

*Competences:* To be able to obtain and to interpret with the suitable computer free software the confidence intervals to do inferences on the population parameters.

Teaching-learning activities:

- Lectures (teaching method): 1 h
- Student work: reading and comprehension of the theory, and problem solving: 1.5 h

#### **Topic BS6: Statistical inference II: hypothesis contrast**

*Descriptors:* Statistical hypothesis test. Definition of hypothesis test. Basic elements in a Test. Types of errors. The significance level. P-value concept.

*Competences:* To understand the concept of statistical hypothesis test as another application of the statistical inference different from the estimation for confidence intervals. To be able of defining the basic hypothesis in the test. To be able to obtain and to explain the conclusion in a hypothesis test.

Teaching-learning activities:

- Lectures (teaching method): 2 h
- Student work: reading and comprehension of the theory, and problem solving: 3 h

#### **Topic BS7: Statistical inference III: selection of tests of statistical contrast**

*Descriptors:* Selection of the statistical test. Types of hypothesis testing. Parametric and nonparametric tests. The most commonly hypothesis tests used in statistical inference with application to the veterinary sciences.

*Competences:* o be able to apply the adequate hypothesis test depending on the null hypothesis.

Teaching-learning activities:

- Lectures (teaching method): 1 h
- Student work: reading and comprehension of the theory, and problem solving: 1.5 h

#### **Topic BS8: Correlation models and linear regression**

*Descriptors:* Two-dimensional quantitative variables. Concept of linear correlation coefficient. Linear regression model. Linear correlation model. Obtaining the best fit or regression lines. Residual analysis in regression.

*Competences:* To understand the concept of linear relation between two quantitative random variables. To distinguish between the correlation and the regression. To be able to calculate the correlation coefficient and the regression lines. To understand the analysis of the residuals.

Teaching-learning activities:

- Lectures (teaching method): 1 h
- Student work: reading and comprehension of the theory, and problem solving: 1.5 h

#### **Seminar BS\_prob: Problems of probability**

*Descriptors:* To solve problems related with topics BS1, BS2, BS3 y BS4. *Competences:* To apply concepts included in topics BS1, BS2, BS3 y BS4.

Teaching-learning activities:

- Practical seminar: 1 h
- Student work: to solve problems in classroom: 1 h

#### **Seminar BS\_inf: Problems of statistical inference**

*Descriptors:* To solve problems related with topics BS5, BS6 y BS7.

*Competences:* To apply concepts included in topics BS5, BS6 y BS7.

Teaching-learning activities:

- Practical seminar: 1 h
- Student work: to solve problems in classroom: 1 h

## **PRACTICES OF EPIDEMIOLOGY**

#### **Practice Epi1: Diagnostic tests**

*Descriptors and competences:* The correspondents to the topic Epi3.

*Activities education - learning:*

- Practical classes: 2 h
- Student work: Student work: revision of theoretical concepts and review of the exercises 1 h

#### **Practice Epi2: Calculation of sample size**

*Descriptors and competences:* The correspondents to the topic Epi4.

Teaching-learning activities:

- Practical classes: 1,5 h
- Student work: revision of theoretical concepts and review of the exercises 1 h



**Practice Epi3: Stratified results. Average values and differences between proportions**

*Descriptors and competences:* he correspondents to the topics Epi4, Epi9 and BS7.

Teaching-learning activities:

- Practical classes: 1,5 h
- Student work: revision of theoretical concepts and review of the exercises 1 h

**Practice Epi4: Cross-sectional disease measurements**

*Descriptors and competences:* The correspondents to the topics Epi4 and Epi9.

Teaching-learning activities:

- Practical classes: 2 h
- Student work: revision of theoretical concepts and review of the exercises 1 h

**Practice Epi5: Longitudinal disease measurements**

*Descriptors and competences:* The correspondents to the topics Epi4 and Epi10.

Teaching-learning activities:

- Practical classes: 1,5 h
- Student work: revision of theoretical concepts and review of the exercises 1 h

**Practice Epi6: Risk estimation**

*Descriptors and competences:* The correspondents to the topics Epi4 and Epi11.

Teaching-learning activities:

- Practical classes: 2 h
- Student work: revision of theoretical concepts and review of the exercises 1 h

## **Epidemiological study**

*Descriptors and competences:* The correspondents to all the realized topics of the subject of form integrated across the resolution of an epidemiological and statistical study of an animal population

Teaching-learning activities:

- Lectures (teaching method): 5,5 h (the first meeting of 2,5 h and the second meeting of 3 h)
- Student work: reading and comprehension of the theory, and achievement of the exercises, 2 h

## **PRACTICES OF BIOSTATISTICS**

**Practice BS1: Probability distributions**

*Descriptors and competences:* The corresponding to the topics BS1, BS2 and BS3.

Teaching-learning activities:

- Practical classes: 2 h
- Student work: revision of theoretical concepts and review of the exercises 1 h
- Student work: reviewing of the theoretical concepts associated to the topics: 1h

**Practice BS2: Descriptive statistics**

*Descriptors and competences:* The corresponding to the topics BS4 and BS5.

Teaching-learning activities:

- Practical classes: 2 h
- Student work: reviewing of the theoretical concepts associated to the topics: 1h

**Practice BS3: Introduction to the Statistical inference**

*Descriptors and competences:* The corresponding to the topics BS6 and BS7.

Teaching-learning activities:

- Practical classes: 2 h
- Student work: reviewing of the theoretical concepts associated to the topics: 1h

**Practice BS4: Correlation analysis. Simple Linear Regression** *Descriptors and competences:* The corresponding to the topic BS8.

Teaching-learning activities:

- Practical classes: 2 h
- Student work: reviewing of the theoretical concepts associated to the topics: 1h

## Summary of the activities of education - learning

Activity	Presential Hours	Factor	Autonomous work /No Attend	Total
Classes of theory	34	1.5	51	84
Seminars and problems	2	1.5	4	6
Practices	24	0.5	12	36
Practical work			15	15
Tutorships			5	5
Examinations			4	4
<b>Total</b>	<b>60</b>		<b>90</b>	<b>150</b>

### 4.3.Syllabus

The topics of both matters will be alternated to improve the knowledge integration, and it can change lightly the order depending on the academic calendar in force. All the changes will be notified across the teaching platform of the subject (<http://alp4eb.winepi.net>).

#### THEORETICAL TOPICS OF EPIDEMIOLOGY

- Topic Epi1: Types of variables and scales of measurement
- Topic Epi2: Introduction to the Epidemiology
- Topic Epi3: Evaluation of diagnostic tests
- Topic Epi4: Sampling
- Topic Epi5: Elements of Qualitative Epidemiology
- Topic Epi6: Causality
- Topic Epi7: Epidemiologic surveys
- Topic Epi8: Design of epidemiological studies
- Topic Epi9: Cross-sectional observational studies
- Topic Epi10: Longitudinal observational studies
- Topic Epi11: Risk estimation
- Topic Epi12: Theory of decision

#### THEORETICAL TOPICS OF BIOSTATISTICS

- Topic BS1: Probability distributions
- Topic BS2: Conditional probability
- Topic BS3: Frequencies
- Topic BS4: Descriptive statistics
- Topic BS5: Statistical inference I: confidence intervals
- Topic BS6: Statistical inference II: hypothesis contrast
- Topic BS7: Statistical inference III: selection of tests of statistical contrast
- Topic BS8: Models of interrelation and linear retrogression
- Seminar BS\_prob: Problems of probability
- Seminar BS\_inf: Problems of statistical inference

#### PRACTICES OF EPIDEMIOLOGY

- Practice Epi1: Diagnostic tests
- Practice Epi2: Calculation of sample size

Practice Epi3: Stratified results. Average values and differences between proportions

Practice Epi4: Cross-sectional disease measurements

Practice Epi5: Longitudinal disease measurements

Practice Epi6: Risk estimation

Epidemiological study

## **PRACTICES OF BIOSTATISTICS**

Practice BS1: Probability distributions

Practice BS2: Descriptive statistics

Practice BS3: Introduction to the Statistical inference

Practice BS4: Correlation analysis. Simple Linear Regression

### **4.4.Course planning and calendar**

The dates and key milestones of the subject are described in detail, together with those of the rest of subjects of the first course in the Veterinarian's Grade, on the Web page of the Faculty of Veterinary Sciences (<https://veterinaria.unizar.es/horarios1vet>). The above mentioned linkage will be updated to the beginning of every academic course.

Also they will be available of form more detailed across the teaching platform of the subject (<http://alp4eb.winepi.net>).

### **4.5.Bibliography and recommended resources**