

**Laboratory Experimentation**

Code: 103249  
ECTS Credits: 6

Degree	Type	Year	Semester
2501925 Food Science and Technology	FB	1	A

**Contact**

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**Use of Languages**

Principal working language: catalan (cat)  
Some groups entirely in English: No  
Some groups entirely in Catalan: Yes  
Some groups entirely in Spanish: No

**Teachers**

Maria Lourdes Abarca Salat  
Elena Albanell Trullas  
Maria Rosa Bragulat Arara  
Francisco Javier Cabañes Sáenz  
Joaquín Castellà Espuny  
Gemma Castella Gómez  
Francisco Céspedes Mulero  
Anna Genescà Garrigosa  
Jordi Bartolomé Filella  
Teresa Anglada Pons  
Ana Maria Ortuño Romero

**Prerequisites**

There are no official prerequisites, but it is appropriate for the student to be attending simultaneously or having passed the subjects: Chemistry I, Chemistry II, Animal Biology, Plant Biology and Cellular Biology and Microbiology and Parasitology of the Degree in Food Science and Technology.

The students must have passed the theoretical exam on Safety in Laboratories. This exam can be done through the Virtual Campus.

**Objectives and Contextualisation**

This is a first-year, basic and practical subject. In this subject the student will have to acquire the skills to apply some basic techniques of the areas of Chemistry, Biology, Microbiology and Parasitology. In addition, the student will have to acquire a general view of the importance of experimentation in food industry.

The specific training objectives are:

#### Objectives of the Chemistry part

- Learn how to use the analytical, precision and granular balances
- Apply volumetric techniques and verify accuracy
- To know the different techniques of separation and purification of solids
- Calibrate a pHmeter
- Understand the relative strength of acids and bases
- Understand the buffer solutions of pH work
- Synthesize organic and inorganic compounds, and calculate the yield
- Understand the bases and learn how to use different analytical techniques of quantitative analysis based on volumetric and spectrophotometric methods.
- Determine the concentration of certain molecules in real samples following the different stages of the analytical process.

#### Objectives of the Biology part

- Recognize the anatomical and morphological characteristics of the different plant and animal groups
- Know the use of dichotomy keys for the determination of plants and animal species.
- Identify and taxonomically classify several plant and animal species.
- Consolidate the use of stereoscopic and optical microscopes and the preparation of samples for both types of microscopy.
- Observe different types of cells and cellular structures.
- Learn to interpret images obtained with different types of optical and electronic microscopy
- Understand the operation of the mitotic spindle and the contractile ring by observing the mitotic division in different types of cells

#### Objectives of the Microbiology and Parasitology part

- Understand the basic microbiological and parasitological techniques and methods.
- Know and differentiate the main types of microorganisms and parasites of interest in Food Sciences.

### **Competences**

- Analyse, summarise, resolve problems and make professional decisions.
- Apply knowledge of the basic sciences to food science and technology.
- Apply the scientific method to resolving problems.
- Show sensitivity to environmental, sanitary and social issues.
- Show understanding of the mechanisms by which raw materials deteriorate and the reactions and changes that take place during storage and processing, and apply the methods for controlling this.
- Use IT resources for communication, the search for information within the field of study, data processing and calculations.

### **Learning Outcomes**

1. Analyse, summarise, resolve problems and make professional decisions.
2. Apply and interpret the results of basic microbiological techniques.
3. Apply dissection methods for the observation and analysis of the internal anatomy of representative examples of the principal animal groups of interest in nutrition.
4. Apply suitable methodologies to the observation, identification, handling and conservation of the principal animal and plant species of interest in nutrition.

5. Apply the scientific method to resolving problems.
6. Classify the classical methods of gravimetric, volumetric and biological analysis.
7. Correctly use the protocols for manipulating reagents and chemical waste.
8. Distinguish between and use several basic methodologies for studying the cell and cell functions.
9. Interpret analysis results and assess their quality, relating them to the previous information on the sample.
10. Obtain, treat, recognise, identify and classify the principal parasite species of interest in foods.
11. Plan the strategy to follow at each stage of the analytical procedure that has been adopted to solve the problems faced, based on the material to be analysed and the objective of the analysis.
12. Recognise health and environmental risks associated with the manipulation of chemical and/or biological compounds.
13. Recognise the functioning of cells and basic cellular processes basic through practical experiments.
14. Recognise the stages in the analytic procedure in any type of analysis.
15. Show sensitivity to environmental, sanitary and social issues.
16. State the principles involved in food analysis methods.
17. Use IT resources for communication, the search for information within the field of study, data processing and calculations.
18. Use suitable methods for the isolation, cultivation, identification and conservation of microorganisms.

## Content

The subject is divided in three parts: a first part on Chemistry, a second part on Biology and a third one on Microbiology and Parasitology. As a complementary activity, two conferences will be organized and scheduled to show the students the importance of experimentation and innovation in Food Science and Technology.

### Contents of the part of Chemistry:

Balances Volumetric material

Relative strength of acids and bases. pH shock absorbers. Measurement of pH in food products.

Separation and purification of solids.

Simple extraction

Determination of the acetic acid content in different commercial vinegar samples.

Determination of Vitamin C in a real sample.

Spectrophotometric determination of phenols.

Preparation of a carboxylic acid by oxidation of an aldehyde.

Determination of total hardness in drinking water using samples of tap water and synthetic water.

### Contents of the part of Biology :

#### Cell Biology

Handling of the optical microscope. Preparation of fresh samples for the observation of animal and plant cells.

Visualization of the osmosis process.

Basis of electronic microscopy and characteristics of the images obtained with each type of microscope.

Interpretation of electronic micrographies.

Mitotic cell division of plant and animal cells. Understanding how the mitotic spindle and the contractile ring work during cell division.

#### Plant Biology

Observation in the field of cultivated plants.

Determination and description of species of the main plant groups.

Observation of cell organs and structures of vegetables.

Regulatory Substances for Plant Growth

#### Animal Biology

Observation and recognition of Platyhelminthes and Nematodes.

Observation and study of Molluscs

Observation and recognition of Plathelminths and Nematodes and Anellidestaceans, Arachnids and Insects.  
 Observation and recognition of Chordates: Cephalocordates, Chondrichthyes and Actinopterygies.

Contents of the part of Microbiology and Parasitology:

Aseptic techniques and seeding methods. Microorganism observation and main techniques for microorganism staining.

Techniques for scoring and isolation of microorganisms.

Study of the effect of various physical and chemical factors on microbial development.

Techniques of bacterial and fungal identification.

Morphological study of the main groups of parasites.

Methods for the identification and recognition of parasites and their forms of propagation.

## Methodology

The teaching methodology will be based on learning through the active student work. The teacher will help the students in this active learning process and will give access to the information and supervise their work. In agreement with the formative objectives of the subject and of each of the parts that integrate it, the formative activities are laboratory practical sessions. In the case of the Chemistry part, seminars are held prior to the practice sessions to optimize their development. The students perform the experimental work individually or in groups of two under the supervision of a teacher. Before each practical session, the students must have read the practice the practice guide in order to know the objectives of the session, its basis and the procedures the protocol that must be developed. The objective of the practical lessons is to complete and reinforce the knowledge acquired in the theoretical lessons and seminars of the corresponding subjects. In the practical sessions students will be stimulated to acquire some skills such as the ability to observe and to analyse and interpretate the results obtained. At the beginning of each session there will be an introductory explanation of the theoretical basis of the practical lesson, its interest in Food Science and Technology, how the devices that will be used during the practice work and what are the general safety rules for its development. At the end of each practice the students will be assessed through a test exam (in some cases, the students will find the questions in the guide of the practical lesson).

The teaching material used in the course will be available on the Virtual Campus platform (Moodle). At the beginning of the course the student will have available a guide of all the practical lessons to be carried out in the laboratory. In each lesson the objective/s, basis and methodology will be defined, as well as a section for the results that will be obtained and several questions that need to be answered in each session. This platform will also be used as a mechanism for exchanging information and documents between teachers and students. It is important to note that attendance to all practical sessions is compulsory and that absences must be duly justified. In some cases, the student will also find self-assessment material in the Moodle, which can be used to reinforce the process of knowledge acquisition.

Regarding the Microbiology and Parasitology and the Chemistry sections, in the first session the student must provide the teacher with a signed form (attached to the script) stating that the student knows the rules to work safely in the laboratory and commits itself to comply with these rules. To achieve good performance of these sessions it is necessary that the student has made a prior comprehensive reading of the content of each of the practices.

## Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Conferences	2	0.08	1, 12
Practical sessions of Microbiology and Parasitology (25h), Chemistry (44h) and Animal, Plant and Cell Biology (27h)	96	3.84	1, 5, 2, 4, 6, 8, 16, 9, 10, 11, 13, 12, 14, 7

Seminars	6	0.24	6, 14, 7
Type: Autonomous			
Self study	35.5	1.42	1, 5, 2, 4, 6, 15, 8, 16, 9, 10, 11, 13, 12, 14, 7, 17

## Assessment

### Assessment

The students will be individually assessed after each training activity . To pass the course, a minimum score of 45% must be reached on the maximum score in each of the parts. Each part has a certain weight in the global mark of the subject that is specified below.

- Chemistry (weight of 48% in the final grade of the subject): Continuous assessment during the practical sessions in which a report should be submitted at the end of each session. At the end of all the sessions, a test exam will be done and the laboratory notebooks will have to be presented. The final grade of the chemistry module will be obtained as follows:

Internship report: 85%

Attitude in the laboratory: 10%

Notebooks: 5%

- Biology (weight of 24% in the final grade of the subject): Continuous evaluation throughout all the practices. After each practice a written test a questionnaire or a test type exam will be done.

-Part Microbiology and Parasitology (weight of 24% in the final grade of the subject): Continuous evaluation during the practical sessions in which some questionnaires must be solved and submitted. The attitude and participation in the sessions of the module during the entire learning process will contribute up to 5% of the final grade of this module.

Conferences (weight of 4% of the final grade of the subject): Evaluation through a test exam that will be done at the end of each session.

To pass the subject, attendance at practices and conferences is mandatory.

The final assessment of the subject will be obtained from the weighted average of the assessment of the different contents of each of the parts. To pass the subject it is necessary to obtain a final score equal to or greater than 5 out of a total of 10 points.

Students will be considered not assessable if they have participated in evaluation activities that represent  $\leq$  15% of the final score

## Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Conference test	4%	0.5	0.02	1, 5
Microbiology and Parasitology questionnaires	24%	2	0.08	1, 5, 2, 15, 10, 18, 12
Questionnaires and Biology tests	24%	4	0.16	1, 5, 4, 3, 15, 8, 13

## Bibliography

### BIBLIOGRAPHY AND LINKS

#### Part Chemistry

- Daniel C. Harris, traducció de la 6<sup>a</sup> edició nord-americana, "Anàlisi químic quantitatiu", Editorial Reverté, SA, Barcelona
- Chang, 9<sup>a</sup> edició "Química", McGrawHill, Mèxic American Chemical Society, "Química", Editorial Reverté, 2007, Barcelona

#### Part: Cell, plant and animal Biology

##### Cell Biology

La bibliografia i els enllaços web dels continguts de Biologia Cel·lular s'indiquen en els protocols de pràctiques o, si és el cas, en la Guia Docent de la corresponent assignatura de teoria.

##### Plant Biology

- Narbors, M. W., 2005. *Introducción a la Botánica*. Pearson, Madrid.
- de Bolòs, O; Vigo, J.; Masalles, R.M. i Ninot, J.M. 1990. Flora Manual dels Països Catalans. Editorial Pòrtic, S.A. Barcelona.

##### Link

<http://herbarivirtual.uib.es/cas-ub/estatic/quees.html>

##### Animal Biology

The bibliography and the web links of the contents of Animal Biology are indicated in the protocols of practicals lessons or, as the case may be, in the Teaching Guide of the corresponding theory subject

#### Part Microbiology and Parasitology

##### Microbiology

- Madigan MT, Martinko JM, Dunlap PV, Clark DP. 2009. 12a ed. "Brock Biología de los microorganismos". Pearson Educación, S.A.. ISBN: 9788478290970.
- Willey JM, Sherwood LM, Woolverton CJ. 2009. 7a ed. "Microbiología de Prescott, Harley y Klein". McGraw-Hill-Interamericana, S.A.U. ISBN: 9788448168278.

##### Parasitology

- Cordero del Campillo et al., 1999.- Parasitología Veterinaria, 1<sup>a</sup> edición. McGraw-Hill /Interamericana, Madrid.
- Urquhart GM, Armour J, Duncan JL, Dunn A.M & Jennings FW, 2001.- Parasitología Veterinaria. Editorial Acribia, Zaragoza.

##### Links

<http://www.microbeworld.org/>

<http://microbewiki.kenyon.edu/index.php/MicrobeWiki>

<http://www.dpd.cdc.gov/dpdx/>