INNOVATIONS IN THE INSTRUMENTAL ANALYSIS OF FOOD SENSORIAL PROPERTIES

<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>5226</th>
</tr>
</thead>
</table>

**Tuition Period (semester):** Semester 2

**Duration (in months):** 6

**Type (Mand/Op):** Op

**ECTS Credits:** 5

**Hours (theoretical):** 14

**Hours (practical):** 10

**Hours (other activities):** 101

**LECTURER IN CHARGE OF COURSE (1)**

- **Family Name and First Name:** Jaime Moreno, Isabel
- **University of:** Burgos
- **Department:** Biotecnología y Ciencia de los Alimentos
- **Area:** Tecnología de los Alimentos
- **Room no.:** 114
- **Phone (extension):** 947 25 88 14
- **e-mail:** jaime@ubu.es

### 3.3.1. SPECIFIC EDUCATIONAL OBJECTIVES

**OBJECTIVES:**

Knowledge acquisition: Students are expected to broaden their knowledge of techniques to measure sensorial properties, especially with regard to the most recent equipment and methodology. The basis concepts of sensorial analysis will be reviewed in order to understand the relation between measurement types and as a result the real utility of instrumental measurements.

 Abilities, competences and skills:

- Operate equipment for the instrumental measurement of sensorial properties: texture meter, viscosimeter, chromatograph, electronic nose.
- Select the most appropriate instrumental measurements of colour, texture, aroma, and flavour for different groups of foods.
- Select the analytical conditions and the appropriate type of sample.
- Plan analytical tests on the sensorial properties of foods.
- Take decisions on the processing and commercialisation supported by sensorial properties obtained experimentally or taken from bibliographic sources.

**SUMMARY OF COURSE PROGRAMME:**

**THEORETICAL:**

1. The sensorial properties of foods.
5. Rheology of liquids and textures of solids. Fundamental, empirical and imitative methods.

6. Selection of instrumental measures for different types of foods.

PRACTICAL OR EXPERIMENTAL:

1. Colour measurement of differently formulated and processed foods using a Hunter-Lab spectrophotometer.
2. Study of aromatic profiles obtained with the Alpha-Mos electronic nose of foods stored for different lengths of time. Comparison with the analysis of headspace in gas mass chromatography.
3. Measurement of viscosity in different foods through rotational viscosimeter and capillary viscosimeter.

3.3.2. TEACHING METHOD:

Learning Activities
Lectures that maximise student participation, practical laboratory classes, pilot plants, tasting rooms, etc. directed discussion on certain topics covered in the lecture hall presentations and in the practical sessions, seminars on topics of current interest related to the subject module, which might include expert conferences on the topic, commentary and presentation of certain directed activities in private study time such as practical case studies and bibliographic works, and specific activities designed for continuous assessment.

Allocation of ECTS credits (Approximate student workload in hours):

<table>
<thead>
<tr>
<th>Classroom activity</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures / Directed discussion</td>
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</tr>
<tr>
<td>Practical classes in the laboratory and the pilot plant</td>
<td>10</td>
</tr>
<tr>
<td>Discussion and resolution of practical cases</td>
<td>6.5</td>
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<tr>
<td>Continuous evaluation (specific activities)</td>
<td>4</td>
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<td>On Site - Total Hours:</td>
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</tr>
<tr>
<td>Directed activities in private study time</td>
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<tr>
<td>Research and discussion of scientific bibliography</td>
<td>10</td>
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<tr>
<td>Private study</td>
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<td>Off campus - Total Hours:</td>
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</tr>
<tr>
<td>WORKLOAD TOTAL HOURS:</td>
<td>125</td>
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</tbody>
</table>

3.3.3. ASSESSMENT CRITERIA AND METHOD
The main system of evaluation is continuous assessment, which implies tracking the student’s work throughout the teaching period, assessing behaviour in the laboratory, integration in work groups.
management of bibliographic sources, data processing and discussion, etc. Continuous assessment through commentaries and discussion will take place during theoretical and practical classes. 5 hours

For those who do not pass or complete the continuous assessment tasks, the evaluation will be in the form of a final written exam on the subject matter and will include the search for solutions to a practical problem. In addition, activities to be evaluated such as the resolution of practical cases and bibliographic works.

### 3.3.4. LEARNING RESOURCES

Standard teaching resources will be used in the lectures hall presentations: whiteboard, slide projectors, presentations, and slides using an LCD projector.

Practical classes will be held in the laboratory, pilot plant and tasting room, in order that students become familiar with the equipment that is available: texture meter, viscosimeter, chromatograph, electronic nose, etc.

In addition, internet resources available to the University of Burgos will be used as supporting material, with respect to bibliographic resources: catalogues (UBUcat), databases, magazines and electronic books.

The virtual UBUcampus e-platform will also be used to make information available to students and to propose directed activities for private study and for self-assessment.

### 3.3.5. CLASSROOM LANGUAGE

Teaching will be in Spanish and in if non-Spanish speaking foreign students are enrolled both theoretical and practical classes will be given in English.

With regard to the teaching resources, the great majority of the "on-line" resources, bibliographic sources, etc. will be in English.

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**COURSE**

**FOOD ABIOTIC TOXICOLOGY**

<table>
<thead>
<tr>
<th>Tuition Period (semester)</th>
<th>Duration (in months)</th>
<th>Type (Mand/Op)</th>
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<th>Hours (theoretical)</th>
<th>Hours (practical)</th>
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<td>63</td>
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**LECTURER IN CHARGE OF COURSE (1)**

| Family Name and First Name | Sancho Ortiz, María Teresa  
| University of              | Burgos  
| Department                 | Biotecnología y Ciencia de los Alimentos  
| Area                       | Nutrición y Bromatología  
| Room no.                   | 232  
| Phone (extension)          | 947 258813  
| e-mail                     | mtsancho@ubu.es  

**LECTURER (2)**

| Family Name and First Name | Fernández Muiño, Miguel Angel  
| University of              | Burgos  
| Department                 | Biotecnología y Ciencia de los Alimentos  
| Area                       | Nutrición y Bromatología  
| Room no.                   | 229  
| Phone (extension)          | 947 258868  
| e-mail                     | mafernan@ubu.es  

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3.3.1. SPECIFIC EDUCATIONAL OBJECTIVES

OBJECTIVES:
1.- At the end of the course, the student should be fully familiar with natural toxic compounds, as well as additive and contaminating compounds that might be present in different foods and that imply a potential risk to human health.
2.- At the end of the course, the student should be fully familiar with potentially toxic doses, and acute as well as chronic mechanisms of toxicity, symptomatology and methods of eliminating or neutralising toxic compounds that might be in found in foods.

COURSE PROGRAMME SUMMARY:

THEORETICAL:
1.- Short history and fundamental aspects of food toxicology.
2.- Acute and chronic toxicity.
3.- The concept of a toxic dose and a lethal dose. Mechanisms of liberation, absorption, distribution, action and elimination of the toxic compounds present in foods. Possibilities of their neutralisation.
4.- Natural toxins present in foods. Analytical methods.
5.- Potential toxicity of food additives. Analytical methods.
6.- Toxic compounds produced in the course of food processing. Analytical methods.
7.- Toxins produced by pathogenic agents in foods. Analytical methods.
8.- Pollutants in foods. Analytical methods.

PRACTICAL OR EXPERIMENTAL:

3.3.2. TEACHING METHOD:

Learning Activities
3 ECTS credits. 30 hours of theoretical classes. 42 study hours and work that the student has to prepare and present. A 3-hour exam.

The course is imparted through formal theoretical classes using whiteboard to present the subject module and the UBUnet e-platform. The course of study concludes with a preparation by the student of case studies and concrete problems, bibliographic reviews and discussion and presentation of conclusions.

Allocation of ECTS credits (Approximate student workload in hours):

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<tr>
<th></th>
<th>Hours</th>
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<tbody>
<tr>
<td>Lectures / Directed discussion</td>
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<tr>
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<td>Seminars</td>
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<td>Tutorials</td>
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<td>Essays and Presentation</td>
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<td>Assessment Tests</td>
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On Site - Total Hours: 21

Off campus

<p>| | |</p>
<table>
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<td>Workload to prepare theoretical and/or practical classes</td>
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</tr>
<tr>
<td>Solution of exercises, practical cases and questionnaires</td>
<td>10</td>
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<td>Workload to prepare exams and/or evaluation tests</td>
<td>24</td>
</tr>
<tr>
<td>Critical works on scientific publications</td>
<td>14</td>
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</tbody>
</table>
3.3.3. ASSESSMENT CRITERIA AND METHOD
In order to pass the course, a minimum level of 60% attendance in class is required. Should attendance fall below 60%, students will have to complete at least 5 modules from the UBUnet platform. The work presented by students in the seminars will be worth 25% of the final mark. Finally, a course-work exam will be given that will be worth 75% of the final mark.

3.3.4. LEARNING RESOURCES
Human resources:
The lecturers in charge of the course have a long experience in field of toxin analysis and teaching.

Material resources:
The Faculty of Sciences has computerised systems and projects, as well as access to different databases and specialist bibliographies on abiotic toxicology and the food industry.

3.3.5. CLASSROOM LANGUAGE
Spanish

COURSE

<table>
<thead>
<tr>
<th>CODE</th>
<th>SUPERCritical FLUID PROCESSES IN THE FOOD INDUSTRY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuition Period (semester)</td>
<td>Duration (in months)</td>
</tr>
<tr>
<td>Semester 2</td>
<td>1</td>
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</table>

LECTURER IN CHARGE OF COURSE (1)

| Family Name and First Name | Beltrán Calvo, Sagrario |
| University of | Burgos |
| Department | Biotecnología y Ciencia de los Alimentos |
| Area | Ingeniería Química |
| Room no. | 70 |
| Phone (extension) | 947 258810 |
| e-mail | beltran@ubu.es |

3.3.1. SPECIFIC EDUCATIONAL OBJECTIVES
OBJECTIVES:
Knowledge to be acquired by the student:

- Physical and thermodynamic properties of compressed fluids in general and of supercritical fluids in particular and of the mixtures in which they are used.
- The basis of the processes in which compressed fluids are used at any fundamental stage
- Process parameters and the influence of process variables in the performance of different processes that are carried out using compressed fluids
- Particularities and specific problems of the equipment used to work at high pressure.
- Modelling of a process with simple models and the search for design parameters for their introduction on an industrial scale.
- Description of the processes in which fundamental stages of the operations use compressed fluids that are operational in the industry.

The student will acquire skills and competences in order to:

- Research information on a particular topic and make effective use of bibliographic resources and sources of information.
- Acquire psychomotor skills in different experimental techniques and working methods commonly used in technological investigation and its transference to the agroalimentary sector.
- Decide on the viability of a particular technological application that uses compressed fluids and identify those in which such processes would be neither viable nor competitive.
- Evaluate the advisability of starting an investigation into a specific application and development of the research in question.
- Understand and operate a pilot plant for SFE (supercritical fluid extraction)
- Interpret the results of tracking an SFE process.
- Foster favourable attitudes towards team work.
- Clearly assume a position and state a personal opinion on the topics or problems debated in the group.
- Acquire a critical vision of industrial processes and stress the study and the introduction of processes that use clean technologies.
- Learn and contrast opinions and remain open to criticism.

COURSE PROGRAMME SUMMARY:

THEORETICAL:

Topic 1. Introduction.
Course objectives. High-pressure fluid: dense gases and/or supercritical fluids. Dense gases a separation agents. Dense gases as reaction mediums.
Topic 2. Properties of compressed fluids and mixtures with sub-supercritical components.
Definition of supercritical fluids. PVT Diagram. Thermodynamic properties. Transport properties. Superficial tension.
Topic 3. Compressed fluids as solvents.
Heat transference. Correlations for the calculation of the heat transmission coefficients.
Transference of matter. Correlations for the calculation of the coefficients of transference of matter.
Topic 5. Extraction of substances contained in solid substrates with supercritical fluids.
Description of the process. Tracking the course of the extraction. Influence of the process parameters and the conditions of the solid substrate in the extraction process. Extraction models. Applications. Circulation of the solvent. Separation of the solvent from the dissolved substances.

**Topic 6. Multistage counter-current extraction.**
Basic considerations. Modelling of the process. Practical cases.

**Topic 7. Particle formation processes using supercritical fluids.**
Fundamentals of particle precipitation. The RESS process. The PGSS process. Particle precipitation processes with an antisolvent gas: GAS, SAS, PCA, SEDS.

**Topic 8. Concentration processes by adsorption in supercritical fluids.**

**Topic 9. Impregnation.**
Fundamentals of the process of adsorption-desorption. Applications.

**Topic 10. Enzymatic reactions in supercritical fluids.**

**Topic 11. Inactivation of microorganisms at high pressures.**
High-pressure hydrostatic processes. Treatment with supercritical carbon dioxide. Applications

**Topic 12. Other processes with supercritical fluids.**

**Topic 13. Equipment operating under high pressure.**
Regulations for the construction of pressure equipment. Pressure containers. Equipment to transmit pressure. Tubes, valves and accessories. Pilot plant and industrial equipment.

**Topic 14. Safety in processing plants operating under high pressure.**
Risk identification. Risk reduction in design, operation and maintenance. Legislation, norms and design codes.

**PRACTICAL OR EXPERIMENTAL:**

<table>
<thead>
<tr>
<th>Practical Session 1:</th>
<th>Visualization of the elements and structure of a supercritical fluid extraction plant with continuous solvent recirculation.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practical Session 2:</td>
<td>Operation of a pilot extraction plant with supercritical fluids for the processing of an alimentary product</td>
</tr>
<tr>
<td>Practical Session 3:</td>
<td>Visualization of the elements and structure of dynamic analytical equipment for the determination of solubilities of solids in compressed fluids.</td>
</tr>
<tr>
<td>Practical Session 4:</td>
<td>Operation of dynamic analytical equipment for the determination of the solubility of caffeine in compressed carbon dioxide, at different pressures and temperatures.</td>
</tr>
<tr>
<td>Practical Sessions 5:</td>
<td>Simulation of an extraction process using supercritical fluids through the use of a process simulation software programme (e.g.: Aspen Plus)</td>
</tr>
</tbody>
</table>

**3.3.2. TEACHING METHOD:**

**Learning Activities**
Attend and participate in lectures and in directed discussions. The course has 14 formal lectures given by the subject module lecturer in which student participation is encouraged.

Read the material referring to each topic, which will be made available to students on the subject module through the virtual UBUCampus-e platform, as indicated by the course lecturer. On average, the student should dedicate one hour and a half to the study of each hour-long presentation by the lecturer.

Respond to the questionnaires on each topic. The questionnaires have a bearing on the understanding of the concepts introduced in each topic although they are also used as tests to evaluate learning. The responses will be given via the learning platform within the deadlines given in the teaching plan for each topic. It is estimated that a total 7 hours must be given by students to respond to the questionnaires.

Undertake laboratory practice when the times of these practical sessions are made public. 8 hours of laboratory practice over 4 sessions, each of 2 hours, in order to learn about the elements, structures and operation of the high-pressure equipment and plants that are available in the Chemical Engineering laboratory. It is estimated that the student will require 4 additional hours to prepare the reports on the topics developed in the practical sessions.

Attend and participate in the seminars and in the resolution of practical cases. The simulation of a supercritical fluid extraction process will be approached using the Aspen Plus simulation programme in two one-hour sessions in the computer room. It is estimated that the student will use 4 additional hours to use the programme in an individual way and to undertake the simulation of a process of interest.

Collect information on a particular process that uses compressed fluids and that is in use in the food industry, or that is in a developmental phase, in order to draw up a report on the process. This report will be made public in the work folders created for that purpose on the UBUCampus before the deadline indicated by the lecturer. It is estimated that the student will dedicate 6 hours to bibliographic research, reading and preparing the corresponding report. This piece of work will be presented in the classroom for the lecturer and fellow students within a maximum time of 15 minutes. One or more sessions of 3 hours for these presentations are planned, depending on the number of students enrolled on the subject module.

Finally, a written test will be given at the end of the subject module in which the student must demonstrate knowledge of the topics developed throughout the course.

### Allocation of ECTS credits (Approximate student workload in hours):

<table>
<thead>
<tr>
<th>Activity</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures / Teacher directed discussion</td>
<td>21</td>
</tr>
<tr>
<td>Practical Classes (and laboratory notebook compilation)</td>
<td>8</td>
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<tr>
<td>Seminars</td>
<td>4</td>
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<tr>
<td>Tutorials</td>
<td>2</td>
</tr>
<tr>
<td>Essay Presentations</td>
<td>3</td>
</tr>
<tr>
<td>Assessment Tests</td>
<td>2</td>
</tr>
<tr>
<td>Assimilation of theoretical classes</td>
<td>31.5</td>
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<tr>
<td>Responses to questionnaires</td>
<td>14</td>
</tr>
<tr>
<td>Preparation of the report on laboratory practice</td>
<td>4</td>
</tr>
<tr>
<td>Process simulation using Aspen Plus</td>
<td>4</td>
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<tr>
<td>Critical works on scientific publications</td>
<td>31.5</td>
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<tr>
<td><strong>On Site Total Hours:</strong></td>
<td>40</td>
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<td><strong>Off campus</strong></td>
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</tbody>
</table>

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UNIVERSITY OF BURGOS. ECTS INFORMATION CATALOGUE 11-12

MASTER'S DEGREE
3.3.3. ASSESSMENT CRITERIA AND METHOD

General evaluation criteria. Evaluation will be continuous through evaluation of the progress made on the different activities that are proposed throughout the course. The following will be evaluated:

- Attendance and participation at programmed lectures (10 %)
- Questionnaires that are set out for each topic (20%).
- The capacity of the student to understand and operate an EFSC plant and to determine the necessary elements for its design (20 %)
- Computerised simulation of a process (5 %)

At the end of the subject module, the description, development and presentation of the high-pressure process selected by each student (20 %) and a written test of knowledge (25 %) will be evaluated.

Other types of tests

Student who do not pass the evaluation contemplated in the general criteria, will sit a test (oral and written) in which they must demonstrate their knowledge of the subject matter (100 %).

3.3.4. LEARNING RESOURCES

Traditional teaching resources will be used in the lectures imparted in the lecture halls: whiteboard, slide projectors and LCD projectors of presentations and images held on a computer.

Practical classes will be take place in the Chemical Engineering laboratory where students will become familiar with the equipment and the pilot plants available for the study of high-pressure processes.

The seminars will be undertaken in the computer room of the faculty of sciences where the computer terminals are linked to a server running the Aspen Plus simulation programme.

Resources belonging to the University of Burgos will be used on the web as well as the bibliographic resources (the UBUcat catalogue, databases, electronic magazines and databases, etc.) and the UBUCampus virtual platform that will be used to make information available to students and to set directed "on-line" and self-assessment activities.

Web resources

- [http://www.nottingham.ac.uk/supercritical/scintro.html](http://www.nottingham.ac.uk/supercritical/scintro.html): Visualization of the evolution of a substance when its pressure and temperature are modified across the saturation curve
- [http://www.supercriticalfluids.com/REAL_56k_Modem.rm](http://www.supercriticalfluids.com/REAL_56k_Modem.rm): A video in which a small quantity of naphthalene dissolved in SC-CO$_2$ that passes from being a clear solvent to a cloudy one as the pressure drops below the solubility curve. When the pressure increases again, the solvent is once again clear when the naphthalene dissolves in SC-CO$_2$.
- [http://www.chem.leeds.ac.uk/People/CMR/criticalpics.html](http://www.chem.leeds.ac.uk/People/CMR/criticalpics.html): Images of a substance when two phases are formed (liquid + vapour) or when it is found in a supercritical state
- [http://www.uigi.com/carbondioxide.html](http://www.uigi.com/carbondioxide.html): Specific information on carbon dioxide, its properties and usages
- [http://www.ceic.unsw.edu.au/centers/scf/scf_fig1.htm](http://www.ceic.unsw.edu.au/centers/scf/scf_fig1.htm): summary on supercritical fluids: properties and applications

3.3.5. CLASSROOM LANGUAGE
Spanish

### COURSE

<table>
<thead>
<tr>
<th>COURSE</th>
<th>CODE</th>
</tr>
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<tbody>
<tr>
<td>ENZYME TECHNOLOGY IN THE PREPARATION OF FOOD AND INGREDIENTS OF VEGETABLE ORIGIN</td>
<td>5233</td>
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<table>
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<tr>
<th>Tuition Period (semester)</th>
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<th>Type (Mand/Op)</th>
<th>ECTS Credits</th>
<th>Hours (theoretical)</th>
<th>Hours (practical)</th>
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<td>100</td>
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### LECTURER IN CHARGE OF COURSE (1)

<table>
<thead>
<tr>
<th>Family Name and First Name</th>
<th>University of</th>
<th>Department</th>
<th>Area</th>
<th>Room no.</th>
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<tbody>
<tr>
<td>Busto Nuñez, Mª Dolores</td>
<td>Burgos</td>
<td>Biotecnología y Ciencia de los Alimentos</td>
<td>Bioquímica y Biología Molecular</td>
<td>28</td>
<td>947 258800 (ext 8209)</td>
<td><a href="mailto:dbusto@ubu.es">dbusto@ubu.es</a></td>
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### LECTURER (2)

<table>
<thead>
<tr>
<th>Family Name and First Name</th>
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<th>Department</th>
<th>Area</th>
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<td>Ortega Santamaria, Natividad</td>
<td>Burgos</td>
<td>Biotecnología y Ciencia de los Alimentos</td>
<td>Bioquímica y Biología Molecular</td>
<td>24</td>
<td>947 258800 (ext 8210)</td>
<td><a href="mailto:nortega@ubu.es">nortega@ubu.es</a></td>
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### 3.3.1. SPECIFIC EDUCATIONAL OBJECTIVES

**OBJECTIVES:**

As a general objective, the course seeks to deepen the student's knowledge on enzymes of interest to Food Science and Technology. It serves as an introduction to enzymes as biocatalysts, their control and operational stability in order to exploit them to the full. Enzymes as primary components of foodstuffs and their application in the analysis and industrial production of food will both be examined. Furthermore, the student is expected to undertake practical experiments on particular applications of enzymes in the food industry.

Based on the following specific learning outcomes, at the end of the course the student should be able to:

- Understand the principal concepts of industrial enzymology: the effect of environmental conditions on enzymatic kinetics, and enzymatic modulation, amongst other aspects...
- Identify the endogenous enzymes of raw materials and products of vegetable origin.
- Identify and describe the catalytic activity of degrading enzymes of the cellular vegetable wall.
- Select the most appropriate sources from which to obtain enzymes for different industrial applications: industrial production of enzymes, advantages and disadvantages of the microbial, vegetable and animal source of origin.
• Understand the implications of exogenous and endogeneous enzymes in the processing of products of vegetable origin: juices and wines, oil, bread, beer, and starch syrup.

• Describe the practical aspects of enzyme manipulation.

• Analyse and perceive the advantages of enzymatic technology in the processes of the food industry.

• Resolve practical cases of industrial enzymology.

• Understand how to apply enzymes as analytical tools.

• Describe the present state and development perspectives of enzymatic technology applied to the food industry.

COURSE PROGRAMME SUMMARY:

THEORETICAL:

1.- INTRODUCTION TO ENZYMES. 1.1.-Introduction. 1.2.- Endogenous enzymes in food processing. 1.3.- Industrial production of enzymes. 1.4.- Practical aspects of enzyme manipulation.

2.- ENZYMATIC KINETICS. 2.1.-Introduction. 2.2.- Enzymatic catalysis mechanisms. 2.3.- Enzymatic kinetics. 2.3.- The concept of optimality. 2.4.- Factors that affect optimality. 2.5.- The effect of chemical substances on enzymatic activity. 2.6.- Practical examples.

3.- PROTEASES AND PEPTIDASES IN FOOD PROCESSING. 3.1.- Functional modification of proteins. 3.2.- Classification of proteolytic enzymes. 3.3.- Evaluation of proteolytic activity. 3.4.- Applications. 3.5.- Peptidases. 3.6.- Applications.

4.- CELL-WALL-DEGRADING ENZYMES IN VEGETABLES. 3.1.- Structure and composition of the vegetable cell wall. 3.2.- Cell-wall-degrading enzymes. 3.2.1.- Pectinolytic enzymes. 3.2.2.- Hemicellulases. 3.2.3.- Cellulases. 3.2.4.- Amylases.

5.- PRINCIPAL TECHNOLOGICAL FUNCTIONS OF THE PECTINASES. 4.1.- Maceration. 4.2.- Clarification. 4.3.- Liquification. 4.4.- Other applications. 4.5.- Technological functions of the endogenous pectinases.

6.- ENZYMES IN THE PROCESSING OF FRUIT JUICES. 5.1.- Citric juices. 5.1.1.- The stability of juices and concentrates. 5.1.2.- Bitter principles in fruit juices. 5.1.3.- Other enzymes. 5.1.4.- Enzymatic applications in the preparation of orange, mandarin and grapefruit juice. 5.1.5.- Enzymatic applications in the elaboration of lemon juice. 5.2.- Apple juices. 5.2.1.- Enzymatic applications in the apple industry.

7.- ENZYMES IN THE ELABORATION OF WINE. 6.1.- Introduction. 6.2.- Composition of grape juice. 6.3.- Grape pectines. 6.4.- Principal endogenous enzymes present in the grape and grape must. 6.5.- Commercial enzymatic applications in processing.

8.- ENZYMES IN BREAD MAKING. 7.1.- The bread-making process. 7.2.- Enzymes applied to bread making. 7.3.- Future perspectives.

9.- ENZYMES IN THE STARCH INDUSTRY. 8.1.- Characteristics of starch. 8.2.- Enzymes that degrade starch. 8.3.- Products obtained from starch.

10.- ENZYMES IN THE PRODUCTION OF BEER. 9.1.- Application of endogenous enzymes in the production of beer. 8.2.- The future of enzymes in the beer industry.

11.- THE USE OF ENZYMES IN FOOD ANALYSIS. 11.1.- Introduction. 11.2.- The use of enzymes in substrate detection. 11.3.- The use of enzymes in the determination of enzymatic activity. 11.4.- Immune assays. 11.5.- Enzymes in the food analysis. 11.6.- Immobilised enzymes in food analysis. Biosensors.

12.- FUTURE PERSPECTIVES.
13.- LEGAL ASPECTS OF ENZYME USE.

PRACTICAL OR EXPERIMENTAL:

Practical 1 - Evaluation of proteolytic activity. Application of various methodologies.
Practical 3- The effect of additive use on the thermostability of soya lipoxygenase.
Practical 4.- Thermal inactivation of pectinesterase (PE) in orange juice.
Practical 5.- Clarification of apple juice through the use of pectinolytic enzymes.

3.3.2. TEACHING METHOD:

Learning Activities
Formal classes will be used as the teaching-learning methodology, supported by directed discussion sessions, brainstorming and case studies. Personal tutorials will be held with students and on activities carried out in groups.

Activities to be undertaken throughout the course in which students will actively participate include:

- Development and solution of problems.
- Responding to questionnaires.
- Collection of information, the preparation and oral presentation of a report on a theme specific to the course.
- Laboratory practice.
- Development of a “notebook” of experimental ideas.
- Resolution of case studies.
- Directed discussion.

Within these activities, the problem resolution and the questionnaire responses as well as the preparation of a laboratory notebook will be undertaken on an individual basis, whereas the preparation of the report and the laboratory practice will be in groups.

Allocation of ECTS credits (Student workload in hours):

<table>
<thead>
<tr>
<th>Learning activities</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formal Classes / directed discussion / resolution of case studies</td>
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<td>Practical classes</td>
<td>10</td>
</tr>
<tr>
<td>Individual and group tutorials</td>
<td>8</td>
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<tr>
<td>Course-work exam</td>
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<table>
<thead>
<tr>
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<tr>
<td>On Site - Total Hours</td>
<td>34.5</td>
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<tr>
<td>Private study</td>
<td>36</td>
</tr>
<tr>
<td>Solution of exercises, practical cases and questionnaires</td>
<td>15</td>
</tr>
<tr>
<td>Report preparation</td>
<td>35</td>
</tr>
<tr>
<td>Drafting a laboratory notebook</td>
<td>4.5</td>
</tr>
<tr>
<td>Off campus</td>
<td></td>
</tr>
</tbody>
</table>
3.3.3. ASSESSMENT CRITERIA AND METHOD

Students’ work will be tracked and subject to continuous evaluation. To do so, the ability to present results, communicate and summarise work in report form will all be individually evaluated, including work completed in the programmed activities. This will include attitudes, skills and critical analysis during the course of laboratory experiments, as well as the level of acquired knowledge evident from the questionnaire responses, the resolution of problems and the answers given in a written exam.

In the group activities, group work will be evaluated and the attitude towards group work will be assessed on an individual basis, including self-evaluation tests for the follow up and evaluation of active participation in each course component.

The activities carried out will have the same weighting (in percentage terms) in the global qualification:

- Development and resolution of problems: 15%
- Completion of questionnaires: 15%
- Collection of information, analysis and preparation of a report: 20%
- Development of practical work: 15%
- Presentation of the notebook: 10%
- Coursework Exam: 25%

3.3.4. LEARNING RESOURCES

Teaching resources in use include the whiteboard, slide and LCD projectors. The university e-platform will be used to distribute the teaching guide, activities and evaluation criteria, teaching material, setting certain activities, distribution of tasks and interpersonal communication through the subject module e-forum. The e-platform will be used as a tool for group activities, creating working communities that will lead to participation in active, individualised forums.

3.3.5. CLASSROOM LANGUAGE

Spanish

<table>
<thead>
<tr>
<th>COURSE</th>
<th>CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>APPLICATIONS OF IMMOBILIZED BIOCATALYSERS IN THE FOOD INDUSTRY</td>
<td>5234</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tuition Period</th>
<th>Duration (in months)</th>
<th>Type</th>
<th>ECTS Credits</th>
<th>Hours (theoretical)</th>
<th>Hours (practical)</th>
<th>Hours (other activities)</th>
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<tr>
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<table>
<thead>
<tr>
<th>LECTURER IN CHARGE OF COURSE (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family Name and First Name</td>
</tr>
<tr>
<td>University</td>
</tr>
<tr>
<td>Department</td>
</tr>
<tr>
<td>Area</td>
</tr>
<tr>
<td>Room no.</td>
</tr>
</tbody>
</table>
3.3.1. SPECIFIC EDUCATIONAL OBJECTIVES

OBJECTIVES:

The general objective of this subject module, which its subject matter seeks to cover, is to offer students a detailed vision of applications based on immobilisation technology that are used in different processes of the agroalimentary industry. To do so, and prior to the study of the main applications of immobilised biocatalysers the concept of immobilisation will be approached, as well as the main immobilisation methods and the properties of immobilised systems.

Specific objectives to be attained by the student:

- Define the concept of biocatalyser immobilisation.
- Describe the principal methods of immobilisation.
- Compare the properties of immobilised biocatalysers with their free counterparts (kinetic properties, thermal stability, operational...).
- Identify the advantages and disadvantages of using free and immobilised biocatalysers.
- Clarify the differences between the application of cells or immobilised enzymes.
- Describe immobilised biocatalyser applications in analytical techniques.
- Describe the use of enzymes and immobilised cells in the processing of lactose, HFCS, vinegar, beer, additives,...
- Analyse the application of immobilised biocatalysers in the treatment of waste products in the food industry.

COURSE PROGRAMME SUMMARY:

THEORETICAL:

Topic 1. General concepts:
1. Introduction. 2. Concept of immobilisation.

Topic 2. Methods of biocatalyst immobilisation:
1. Introduction 2. Immobilisation methods:
   2.1. Immobilisation by coupling on a solid substrate.
   2.2. Immobilisation by entrapment.
   2.3. Immobilisation by cross-linking.
   2.4. Immobilisation using membranes.
   3. Immobilisation of cells.
   4. Selection of the immobilisation method.
   5. Types of reactors with immobilised biocatalysers.

Topic 3. Properties of the immobilised biocatalysers:
1. Introduction 2. Stability.
4. pH-activity curves.
5. Temperature-activity curves.
6. Other properties.

Topic 4. Industrial applications of the immobilised biocatalysers:
1. Introduction 2. Analytical applications.
3. Industrial applications:
   3.1. Hydrolysis of lactose.
   3.2. Isomerization of glucose.
   3.3. Production of additives.
   3.4. Transesterification.
   3.5. Production of vinegar.
6. Other applications.
4. Treatment of waste products in the food industry.

· Recommended bibliography:

PRACTICAL OR EXPERIMENTAL:
Practical Work 1. Comparative study on the results of the immobilisation of α-glucosidase by entrapment in calcium alginate gels and polyacrylamide gels. The effect of immobilisation on the kinetic properties of the enzyme.
Practical Session 2. Effect of pH on the immobilisation capacity in CMC by ionic bonding with Escherichia coli alkaline phosphatase.

3.3.2. TEACHING METHOD:

Learning Activities
The lecture hall presentation will be used as the teaching-learning methodology supported by directed discussion sessions and case studies. Students will be given ahead of time a copy of a selection of the slides to be presented. Likewise, additional photocopies will be distributed which will include more exhaustive information on the subject matter. Individual tutorials will be given to enrolled students.

The activities to be followed throughout the course in which the students will actively participate, will include:

- Resolution of questionnaires.
- Preparation of a critical article on the objectives, methodology and results of a scientific work published in recognised international magazines, in relation to the topics in the subject matter to be studied.
- Laboratory practicals and compilation of a “notebook” on the practical experiments.
- Resolution of cases and directed discussion.

Among these activities, the questionnaires, the test and the compilation of the laboratory notebook will be developed individually and the laboratory practice will be group work.

Allocation of ECTS credits (student workload in hours):

<table>
<thead>
<tr>
<th>Classroom Setting</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures / directed discussion, case studies</td>
<td>8</td>
</tr>
<tr>
<td>Practical classes</td>
<td>8</td>
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<tr>
<td>Individual and group tutorials</td>
<td>4</td>
</tr>
<tr>
<td>Coursework exam</td>
<td>1</td>
</tr>
</tbody>
</table>
3.3.3. ASSESSMENT CRITERIA AND METHOD

Students work will be tracked and subject to continuous assessment. To do so, their analytical capacities and critical judgment will be individually evaluated, as will a presentation of a research assignment. Evaluation will include attitudes, skills and treatment of the experimental results obtained in the laboratory practice, as well as the level of knowledge acquired during the completion of the questionnaires and the written exam.

The activities will be weighted in the following way:

- Resolution of questionnaires: 20%
- Critical essay: 22%
- Development of practical work: 18%
- Presentation of the notebook: 10%
- Coursework exam: 30%

3.3.4. LEARNING RESOURCES

Didactic resources in use include the whiteboard, slide projects or transparencies and a computer and an LCD projector. The e-platform available throughout the university will be used to distribute the teaching guide, activities and evaluation criteria, teaching material, development of some directed activities, allocation of tasks and personal communication through the subject module forum.

3.3.5. CLASSROOM LANGUAGE

Spanish

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<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>ADVANCED TECHNIQUES IN THE PREPARATION OF GENETICALLY MODIFIED FOOD</th>
<th>5236</th>
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</thead>
<tbody>
<tr>
<td>Tuition Period (semester)</td>
<td>Duration (in months)</td>
<td>Type (Mand/Op)</td>
</tr>
<tr>
<td>Semester 2</td>
<td>2.5</td>
<td>Op</td>
</tr>
</tbody>
</table>

LECTURER IN CHARGE OF THE COURSE (1)

| Family Name and First Name | Pérez Mateos, Manuel |
| University of | Burgos |
3.3.1. SPECIFIC EDUCATIONAL OBJECTIVES

OBJECTIVES:
The aim is for the student to acquire theoretical and practical knowledge on the most recent techniques used to isolate, manipulate and introduce genes into cells other than their original ones, in such a way that the recombining DNA may be replicated, expressed and transmitted to the progeny. In addition to going over these techniques, it is intended to inform the student as to the actual impact of DNA technology on the agroalimentary industry through a detailed study of modern-day applications in this sector.

To complement this, practical laboratory sessions are held on the extraction and isolation of genomic DNA; isolation of plasmidic DNA and observation of the different conformational states; preparation of restriction maps, transformation of E. Coli, preparatory separation of DNA in minicolumns using low-melting-point agarose at a low fusion points; DNA sequencing from plasmides, analysis of microsatellites, real-time PCR (genic and genotype expression of SNP), etc.

COURSE PROGRAMME SUMMARY:

THEORETICAL:
- What is understood by transgenic foods (genetically modified foods)?
- Which are the most recent techniques in genetic engineering used to produce these foods?
  - The concept of genetic engineering
  - Objectives
  - Principal historic achievements in genetic engineering
  - Present-day techniques used for the preparation of modified plants
    - Bio-molecular techniques used in the manipulation of genes (fragmentation and cross-linking of DNA, separation by electrophoresis, hybridization, PCR, sequencing and fragment analysis, etc.)
    - General techniques of genetic manipulation. Cloning of procariot genes.
  - Techniques for the genetic modification of plants
- Can genetic engineering be applied to non-agroalimentary sectors?
- What is the use of transgenic plants?
- What types of GMFs have been placed on the market?
- What are the safest GMFs from the perspective of public health?
- What risks does the production of GNFs involve?
- What is public and social perception of GMFs?
- What legislation regulates the production and commercialization of GMFs?
- What are the social and ethical repercussions of its investigation, production and use?

PRACTICAL OR EXPERIMENTAL:
Extraction and isolation of genomic DNA; isolation of plasmidic DNA and observation of the different conformational states; preparation of restriction maps, transformation of E. Coli, preparatory separation of DNA in minicolumns using low-melting-point agarose; DNA sequencing from
3.3.2. TEACHING METHOD:

Learning Activities

Lecturing techniques will be used in formal teaching sessions supported by directed discussions, through presentations-debates, seeking to maximise student participation and using animated Power-Point slide presentations. Similarly, demonstration videos will be shown and practical classes will be held in the laboratory. All the audiovisual resources (slides, dynamic images, exercises, specific cases, etc.) used in these formal classes will be made available to students, prior to the classes via the electronic platforms UBUCampus-e. Likewise, the platform will also contain supplementary documentation and selected scientific lectures.

To complement these classes, students must also follow a series of classes through the above-mentioned electronic platform. They are expected to carry out a directed search for information using different databases on antioxidant applications in the food industry and its effects on human health, as well as discussions on the electronic forum, and obligatory exchanges with the teacher. To evaluate the results of this research, students will have to answer a questionnaire available through the platform.

Finally, students will have to prepare a critical work on the objectives, methodology, results and discussion of a scientific article and lead its presentation and discussion in a specific session of the seminar attended by the other students. They will also have to prepare laboratory notes that include the fundamental aspects of the practical work carried out and the results obtained.

<table>
<thead>
<tr>
<th>Allocation of ECTS credits (Approximate student workload in hours):</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hours</strong></td>
</tr>
<tr>
<td>Formal lectures on theory and directed discussion</td>
</tr>
<tr>
<td>Practical experimental sessions</td>
</tr>
<tr>
<td>Collective seminars and tutorials</td>
</tr>
<tr>
<td><strong>On Site - Total Hours:</strong></td>
</tr>
<tr>
<td>Workload to prepare theoretical and/or practical classes</td>
</tr>
<tr>
<td>Resolution of exercises, practical cases and questionnaires</td>
</tr>
<tr>
<td>Tutorials through the forum on the electronic platform</td>
</tr>
<tr>
<td>Critical work on a scientific article</td>
</tr>
<tr>
<td>Preparation of laboratory notes</td>
</tr>
<tr>
<td><strong>Off Campus - Total Hours:</strong></td>
</tr>
</tbody>
</table>

WORKLOAD TOTAL HOURS: 75

3.3.3. ASSESSMENT CRITERIA AND METHOD

The evaluation will be undertaken through continuous assessment of the student’s work, seeking to evaluate, with the utmost objectivity, the individual capacity of each student to develop his intellectual capacities of understanding, reflection and critical judgment on the topics under study. Likewise, the attitude and psychomotor skills will be objectively evaluated during the experimental
practice as well as the capacity to resolve problems and practical cases.

To do so, the following evaluation criteria will be used:

- Active participation through the UBUnet intranet platform (10%)
- Attendance and participation in the formal theoretical sessions (20%)
- Attendance at practical classes and preparation of the laboratory notebook (20%)
- Preparation of a critical work related to a scientific article (25%)
- Resolution (through UBUnet) of the proposed questions, problems and practical cases (25%)

3.3.4. LEARNING RESOURCES

The following will be used as learning resources: specialised bibliography, electronic information and genotec databases. The UBUnet intranet platform will be used for "on-line" distance teaching, making intensive use of the subject module forum as the main means of communication and personal tutorials and the inclusion of audiovisual materials, teaching guides, activities, and evaluation methods and criteria. Furthermore, the resolution of practical cases and the evaluation questionnaires will be made available over the platform.

On the whole, the whiteboard, the video projector for documents and the LCD projector for electronic presentations will be used in the formal classes as didactic resources.

3.3.5. CLASSROOM LANGUAGE

Spanish

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### COURSE

<table>
<thead>
<tr>
<th>ROLE OF FOOD IN THE AGEING PROCESS AND ILLNESS</th>
<th>5237</th>
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<tbody>
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<td>Tuition Period (semester)</td>
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</tr>
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<td>Semester 1</td>
<td>6 Op</td>
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</tbody>
</table>

### LECTURER IN CHARGE OF COURSE (1)

| Family Name and First Name | Alonso de la Torre, Sara Raquel |
| University of | Burgos |
| Department | Biotecnología y Ciencia de los Alimentos |
| Area | Nutrición y Bromatología |
| Room no. | 228 |
| Phone (extension) | 947 25 90 03 |
| e-mail | salonso@ubu.es |

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3.3.1. SPECIFIC EDUCATIONAL OBJECTIVES

**OBJECTIVES:**

1. By the end of the course, students shall know how to evaluate the nutritional state of an individual.
2. By the end of the course, students shall know the most advanced criteria for the preparation of individual and collective diets, for ill as well as healthy states.
3. By the end of the course, students shall have gained greater knowledge of the use of food
composition tables, recommended intakes, dietary reference intakes, exchanges, and standard diets.

4. By the end of the course, student shall be able to use state-of-the-art computer software programmes used in the preparation of diets. By the end of the course, students shall have studied, in a critical way, information on nutritional themes found in the media and on the internet.

COURSE PROGRAMME SUMMARY:

THEORETICAL:
Topic 2. The energy balance in human beings. Its role in weight control.
Topic 3. The role of diet and nutrition in corporal composition. Implications in the development of illness and ageing.
Topic 5. Carbohydrates, lipids and proteins: role in health promotion and the prevention of illness. Risks associated with deficiencies or excess amounts.
Topic 6. From essential vitamin and mineral factors to toxic elements.
Topic 7. Diet and nutrition during pregnancy, infancy and adolescence as a modulatory factor in the ageing rhythm and the risk of illness.
Topic 9. Healthy ageing: physical exercise
Topic 12. Situations of malnutrition: obesity, malnutrition and deficiency illnesses. Importance of these situations at an advanced age.
Topic 14: Nutrition and cancer.
Topic 15: Nutrition and diabetes mellitus.
Topic 16. Effect of pharmaceutical drugs on diet and the uptake of nutrients.

PRACTICAL OR EXPERIMENTAL:
Practical Session 1: Use of food composition tables. The study of diet compositions.
Practical Session 2: Calculation of the energy needs of the human organism.
Practical Session 3: A 24-hour diet recall.
Practical Session 4: Evaluation of the nutritional state using anthropometric and bioimpedance measures.
Practical Session 5: Preparation of a collective diet for a residence for the elderly.
Practical Session 7: Evaluation of the quality of different diets. Use of information packets for the preparation and estimation of diets.
Practical Session 8: Questionnaire on the frequency of food consumption.
Practical Session 9: Internet search for information on nutrition and diet on ageing and the prevention of illnesses.

3.3.2. TEACHING METHOD:

Learning Activities
- Discussions-lectures, assisted by various audiovisual devices.
- Laboratory practicals: Evaluation of the nutritional state by biochemical, anthropometric, and bioimpedance methods as well as dietary questionnaires.
- Internet and media-based information searches.

ECTS credit allocations (Approximate Student workload in hours):

<table>
<thead>
<tr>
<th>Activity</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures /Directed discussions</td>
<td>12</td>
</tr>
<tr>
<td>Practical Classes (and laboratory notebook compilation)</td>
<td>12</td>
</tr>
</tbody>
</table>
### 3.3.3. ASSESSMENT CRITERIA AND METHOD

Continuous assessment.
- Preparation and evaluation of diets in different physiopathological situations.

### 3.3.4. LEARNING RESOURCES

**Human resources:**
The teachers in charge of the course possess great experience in the use of techniques to evaluate corporal composition and nutritional states as well as in the evaluation and preparation of diets for different groups.

**Material resources:**
The Nutrition and Food Science Area possesses all the necessary equipment for the measurement of the corporal composition of an individual.

### 3.3.5. CLASSROOM LANGUAGE

Spanish

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### COURSE

**MODERN-DAY INTEGRATED QUALITY MANAGEMENT IN THE FOOD INDUSTRY**

<table>
<thead>
<tr>
<th>Tuition Period (semester)</th>
<th>Duration (in months)</th>
<th>Type (Mand/Op)</th>
<th>ECTS Credits</th>
<th>Hours (theoretical)</th>
<th>Hours (practical)</th>
<th>Hours (other activities)</th>
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<td>25</td>
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</table>

**LECTURER IN CHARGE OF COURSE (1)**

| Family Name and First Name | Jordi Rovira Carballido |
3.3.1. SPECIFIC EDUCATIONAL OBJECTIVES

OBJECTIVES:

1. Enable the student to appreciate that quality is a broad concept, which can be approached from various perspectives in the firm. The food industry undertakes to produce uniform, quality foods on time, in good condition from the nutritional point of view (healthy), and safe; with public health guarantees for the consumer.

2. Pass on to the student the concept of Total Quality as a satisfactory system when designing a quality plan for an agroalimentary firm.

3. The student will learn to design an APPCC system for the agroalimentary industry.

4. Provide the student with the knowledge to set up a Quality Management system based on the ISO 9001-2000 standard.

5. Ensure that the student understands the different accreditation systems for food safety, the ISO 22000 standard, and other initiatives such as BRC, EFSIS, EURO GAP, SAL, and the Danish Standard. Equip the student with an understanding of the principal differences between these systems and of how to choose the most appropriate one in the best interests of the agroalimentary firm.

6. Ensure that the student understands the different systems that guarantee the quality of traditional foodstuffs, such as DOP, IGP or ETG and the standards referring to the ecological production of foods.

7. Provide the student with the necessary resources and skills to implant any system or quality protocol in the agroalimentary industry.

COURSE PROGRAMME SUMMARY:

THEORETICAL:

Introduction. Presentation of the subject module and its objectives.

Block A. Basic concepts of quality.

Topic 1: The concept of quality. Brief historical review of quality and its evolution as a concept.

Block B. Quality assurance of manufactured product. Food Safety Management.

Topic 4: Introduction to food safety.
Topic 5: Dangers and risks.
Topic 6: Prerequisite programmes.
Topic 7: The APPCC system.
Topic 8: Risk Evaluation.
Topic 9: Traceability Systems (from the farm to the table).
Topic 10: Different strategies to certify food safety. EURO-GAP, BRC, EFSIS, IFS, GFSI, SAL, ISO 22.000.

Block C. Quality assurance of the manufacturing method.

Topic 12: Total quality. EFQM:
3.3.2. TEACHING METHOD:

**Learning Activities**

The subject module is worth 5 ECTS credits, which implies that students will have to dedicate 125 hours to the module. 50 of these 125 hours will be formal classes, (2 ECTS credits), and 75 will be private study time (3 ECTS credits), in line with the general criteria that a student needs 1.5 study hours for each hour of formal class. The subject module will be taught by two professors Dr. Jordi Rovira of the Area of Food Technology of the University of Burgos (40 hours; 1.6 ECTS credits) and by Dr. Martín A. Checa from Campofrío Alimentación, S.A. a large agroalimentary firm. (10 hours; 0.4 ECTS credits).

The following activities are planned throughout the 50 hours of formal classes:

**Lectures:** (30 hours) The lectures will serve to point out the broad lines of the subject module to students and will provide them with the most important concepts and strategies for the preparation of a quality plan. 20 of the 30 hours will be taught by Dr. Jordi Rovira and 10 by Dr. Martín A. Checa, of which 2 hours will be taken up by a final evaluation.

**Seminars and group work:** (12 hours) The objective is for the students to learn to work in a team, to distribute tasks between each other and to organise themselves in order to set up a quality project. In these sessions, the tutor will be present in the classroom or in his office and will attend to different groups of students, responding to their questions and guiding them towards the solution to the proposed problem. Two types of exercises are proposed: the case studies and the development of particular projects associated with a quality plan (APPCC, ISO 9000/2000, etc). In both cases, a certain length of time will be given over to general discussion and project presentations, simulating the activity carried out by the quality team in a firm or a consultancy team.

**Conferences:** (5 hours) It is proposed to invite two speakers to complete the overall picture given by the course lecturers. Dr. Pieternel Luning. University of Wageningen. "Food quality management: a techno-managerial approach" (3 hours). Alberto Berga. AMB Consultants. “The new food safety standard - ISO 22.000” (2 hours).

**Visits:** (3 hours) A visit will be made to Campofrío Alimentación, S.A in Burgos, to see “in situ” how a Quality Department works in the agroalimentary industry.

**ECTS credit allocations (Approximate student workload in hours):**

<table>
<thead>
<tr>
<th>Classroom</th>
<th>Hours</th>
</tr>
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<td>Seminars</td>
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<tr>
<td>Conferences</td>
<td>6</td>
</tr>
<tr>
<td>Visits</td>
<td>3</td>
</tr>
<tr>
<td>Assessment Tests</td>
<td>3</td>
</tr>
</tbody>
</table>
3.3.3. CRITERIA AND ASSESSMENT METHOD

Student progress will be evaluated using three different criteria, and at all times in the context of a daily evaluation of their work. Students are expected to progress slowly but surely and to acquire and master the essential concepts in such a way that they are fully internalised. Likewise, they are expected to apply those concepts to situations that resemble, as far as possible, the working practice of the firm that will form part of their professional life. The final mark will be given by the sum of the three different sections.

1. **Self-assessment questionnaires** at the end of each topic. These questionnaires are designed so that students can verify their progress after the study period, in each one of the topics that constitute the subject matter. These questionnaires are found on the “on-line” learning platform that is accessible to students. The computerised system records the number of times that students have consulted the platform and the results of the self-assessment questionnaires, for each one of the students. The marks obtained in these questionnaires will represent 20% of the final mark.

2. **Resolution of cases and teamwork**. This section contains the most important part of the subject module, for which reason it represents 50% of the final mark. It is considered the most important because its mark reflects whether the student has understood and mastered the theoretical concepts and is able to use them for the resolution of the real-life situations that are proposed. Teamwork is also considered very important. Problems of quality, because of their complexity, can only be resolved in general from a multidisciplinary approach based on teamwork, harnessing the different potentials and the synergy of the different participants, for which reason it is considered primordial in the students' training that they are capable of integrating and organizing their work as part of a team.

3. **Final Exam**. A final test is considered appropriate, which might be oral, to evaluate the student's global knowledge of the subject module, and to verify that the student has been able to integrate the different parts of the whole. The final test will amount to 30% of the final mark, and as may be seen will be decisive in defining the student's final mark.

3.3.4. LEARNING RESOURCES

The resources available in the Faculty of Science will be used, which basically consist of:

1. For lectures, “PowerPoint” presentations are used that are displayed in class using LCD projectors that are now available. At times, various web sites are project in the same lecture hall. Slide projectors may also be used.

2. “On-line” learning platform. Without any doubt, a significant tool that allows the student to obtain the most relevant material to follow up the work in class and its subsequent study. The faculty has
a computer room, as well as “wifi” connections from the library and the study halls, where students can connect their computers working in private or in groups. All the information concerning the organisation and the structure of the study module is made available on the “on-line” platform. This includes the criteria for its evaluation, the presentations used by the teachers in the class, the cases under study, the self-assessment questionnaires, additional information of interest for the student, and also discussion forums, for follow up and authorisation of the group work to be carried out by the students. The student also has access to the UBU library page through this platform, from which it is possible to consult databases, electronic books and “on-line” magazines available in the University library.

3. Library and study halls. Students have a faculty library available to them containing a wide range of books and magazines that can be consulted in relation to quality management.

4. Computer Room. The computer room is used on some occasions for formal lectures, and can also be used for group work, where a computer and internet access greatly facilitate the task of writing up and preparing the group work.

3.3.5. CLASSROOM LANGUAGE
In this first course, the subject module will be taught in Spanish, although the conferences given by Dr. Pieternel Luning of the University of Wageningen will be in English. Likewise, much of the information which the students will access will also be in English, for which reason it is advisable that they possess a good level of knowledge in this language.

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### COURSE

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<thead>
<tr>
<th><strong>NATURAL ANTIOXIDANTS AND OXIDATIVE STRESS</strong></th>
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### LECTURER IN CHARGE OF COURSE (1)

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<th><strong>Department</strong></th>
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<td>Pérez Mateos, Manuel</td>
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<td>Biotecnología y Ciencia de los Alimentos</td>
<td>Bioquímica y Biología Molecular</td>
<td>22</td>
<td>8816</td>
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### LECTURER (2)

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<td><a href="mailto:pmuniz@ubu.es">pmuniz@ubu.es</a></td>
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</table>
### 3.3.1. SPECIFIC OBJECTIVES

**OBJECTIVES:**

The student is expected to acquire a solid training in conceptual, fundamental and applied

of oxidative stress and the causes that produce it, the detailed characteristics and etiology of the

illnesses derived from oxidative stress and the main characteristics and action mechanisms of the

natural antioxidants that are present in foodstuffs.

Likewise, it is intended to train students in the development of lines of research and to

provide them with a degree of specialisation in the use of the more recent analytical strategies used

for the study of oxidative stress *in vitro e in vivo.*

### COURSE PROGRAMME SUMMARY:

**THEORETICAL:**

| --- |

**PRACTICAL OR EXPERIMENTAL:**

- Testing antioxidant capacity in juices. ABTS, DPPH
- Electrophoretic study of the inhibition of oxidative damage to DNA.

### 3.3.2. TEACHING METHOD:

**Learning Activities**

Formal classes will use the lecture hall technique supported by directed discussions, through presentations-debates, seeking to maximise student participation and using animated Power-Point slide presentations. Similarly, demonstration videos will be shown and practical classes will held in the laboratory. All the audiovisual resources (slides, dynamic images, exercises, specific cases, etc.) used in these formal classes will be made available to students, prior to the classes via the electronic platforms UBUCampus-e. The platform will also make supplementary documentation available and selected scientific lectures.

To complement these classes, students must also follow a series of classes through the above-mentioned electronic platform. They are expected to carry out a directed search for information using different databases on antioxidant applications in the food industry and their effects on human health, as well as join in discussions on the electronic forum, and mandatory exchanges of information with the teacher. To evaluate the results of this research, students will have to answer a questionnaire made available through the platform.
Finally, students will have to prepare a critical work on the objectives, methodology, results and discussion of a scientific article and lead its presentation and discussion in a specific session of the seminar attended by fellow students. They will also have to prepare laboratory notes that include the fundamental aspects of the practical work and the results obtained.

**ECTS credit allocations (Approximate student workload in hours):**

<table>
<thead>
<tr>
<th>Class setting</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formal classes, directed discussions and presentation.</td>
<td>6</td>
</tr>
<tr>
<td>Practical experimental sessions</td>
<td>12</td>
</tr>
<tr>
<td>Collective seminars and tutorials</td>
<td>2</td>
</tr>
<tr>
<td><strong>On Site - Total Hours:</strong></td>
<td>20</td>
</tr>
<tr>
<td>Private study for preparation of classes (theoretical/practical/ and other activities)</td>
<td>25</td>
</tr>
<tr>
<td>Tutorials through the electronic platform and forum</td>
<td>5</td>
</tr>
<tr>
<td>Reading of scientific texts and preparation of summaries. Resolution of exercises, practical cases and questionnaires</td>
<td>10</td>
</tr>
<tr>
<td>Critical work on a scientific article</td>
<td>10</td>
</tr>
<tr>
<td>Preparation of laboratory notes</td>
<td>5</td>
</tr>
<tr>
<td><strong>Off Campus - Total Hours:</strong></td>
<td>55</td>
</tr>
<tr>
<td><strong>WORKLOAD TOTAL HOURS:</strong></td>
<td>75</td>
</tr>
</tbody>
</table>

### 3.3.3. CRITERIA AND ASSESSMENT METHOD

The evaluation will be undertaken through continuous assessment of the student's work, seeking to evaluate, with the utmost objectivity, the individual capacity of each student to develop his intellectual capabilities of understanding, reflection and critical judgment on the topics under study. Likewise, the attitude and psychomotor skills will be objectively evaluated during the experimental practice, as well as the capacity to resolve problems and practical cases.

To do so, the following evaluation criteria will be used:

- Active participation through the UBUNet intranet platform (10%)
- Attendance and participation in the formal theoretical sessions (20%)
- Attendance at practical classes and preparation of the laboratory notebook (20%)
- Preparation of a critical work related to a scientific article (25%)
- Resolution (through UBUNet) of the proposed questions, problems and practical cases (25%)

### 3.3.4. LEARNING RESOURCES

The following will be used as learning resources: specialised bibliography, electronic information and databases. The UBU-net platform will be used for "on-line" distance teaching, making intensive use of the subject module forum as the main means of communication as well as personal tutorials and the diffusion of audiovisual materials, teaching guides, activities, and evaluation methods and criteria. Furthermore, the resolution of practical cases and the evaluation questionnaires will be made available over the platform.

In general, the whiteboard, the video projector for documents and the LCD projector for electronic presentations will be used in the formal classes.

**Comentario [ARP4]:** ¿Es referencia a la marca cañón?
### 3.3.5. CLASSROOM LANGUAGE

Classes will be taught in Spanish. If foreign students do not speak Spanish, English will be used. Documentation and bibliography will preferably be in English.

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### COURSE

**BIOACTIVE FOOD NON-NUTRITIONAL CONSTITUENTS: PHENOLIC COMPOUNDS**

<table>
<thead>
<tr>
<th>Tuition Period (semester)</th>
<th>Duration (in months)</th>
<th>Type</th>
<th>ECTS Credits</th>
<th>Hours (theoretical)</th>
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### LECTURER IN CHARGE OF COURSE (1)

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<td><a href="mailto:marglez@ubu.es">marglez@ubu.es</a></td>
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### 3.3.1. SPECIFIC EDUCATIONAL OBJECTIVES

**OBJECTIVES:**

**In relation to knowledge.-**
The course aims to broaden and deepen each student's knowledge of phenolic compounds:
- their presence in foodstuffs,
- their properties,
- their relation to the final quality of foodstuffs of vegetable origin.

Special emphasis is placed on the study of their modifications during food processing, and operating methods and processes that will reduce negative effects and boost positive ones, in order to produce food of better sensorial and nutritional quality and with greater added value etc…

It is also intended to develop the student's knowledge of the analytical aspects of these compounds.

**In relation to abilities and skills.-**
The aim is for the students to develop skills in relation to:
- the analysis and evaluation of the different types of phenolic compounds present in foods, discernment and a critical awareness of results that are obtained as quality indicators.
- the correlation of data on phenolic content, enzymatic activities, environmental conditions, etc. and the useful life of the foodstuff, its conditions, ideal handling and storage conditions, etc., and the ability to arrive at conclusions and develop decision-making ability.
- the anticipation of possible negative food-packaging interractions related to phenolic content.
- the design/development/control of processes and/or their conditions with positive effects on phenolic composition in foods, which will therefore lead to foods of greater quality and added value.
- research specific information on the subject matter of the course and interpret the
information in a satisfactory way.

- public presentations of results:
  - skills development
  - processes
  - planning activities

The student is expected to develop the ability to arrive at rapid and logical answers related to the subjects covered on the course. It is intended to broaden the student's training by improving and stimulating abilities required not only in the business sector, but also in the field of scientific research, where efficient and accurate dissemination of information is increasingly called for with ever-greater insistence, above all in the food industry.

- A capacity to draft concise and well-structured reports.

### COURSE PROGRAMME SUMMARY:

#### THEORETICAL:

**Introduction.**

1. Revision of general concepts related to phenolic compounds: definition, properties, types and presence in foodstuffs.
2. Brief summary of the analytical methods applied in its evaluation.

**Block I. Modifications of phenolic composition during food processing.**

3. Stability of phenolic compounds in the presence of environmental agents: presence of metals, pH changes, oxygen levels, temperature, etc.
5. Modifications specific to food processing. Transformation of structures and formation of new compounds: degradation, condensation and polymerization, etc.
6. Modifications during storage. Interaction with the packaging.

**Block II. Effects on the quality of foodstuffs.**

7. Healthy effects, food intake, absorption and beneficial modifications.
10. Indicators of food type and attributes. Possible indicators in the detection of adulterated and false foodstuffs.

#### PRACTICAL OR EXPERIMENTAL:

1. Preparation of different foodstuffs of vegetable origin: marmalades; conserves, wine, cider, etc. processed under varied conditions, and the study of the effect on the phenolic composition and its sensorial properties.
2. Isolation and characterisation of phenolic compounds by families (spectrophotometric methods) and detailed analysis (HPLC - High Performance Liquid Chromatography - and GLC - Gas Liquid Chromatography - analysis of volatile compounds).
3. Obtaining stable extracts for application in other processes. Stability studies and techniques to prolong storage life.
4. Evaluation of colour and turbidity, where necessary, and of food flavour (with special emphasis on bitterness and astringency). Use of instrumental and sensorial methods and comparative studies, where necessary.
5. Evaluation of the potential redox, FRAP and other similar methods indicating modifications in the antioxidant capacity (these are determined from natural antioxidants and oxidative stress, in collaboration with the teaching staff on the course in order to avoid repeating subject matter).
6. Statistical evaluation of the discriminatory power and applications to distinguish between foodstuffs and detect false foodstuffs.

Students learn about and carry out treatment processes followed up by a subsequent analysis of phenolic compounds (spectrophotometry, HPLC, GLC, etc) present in the raw materials and in the processed food.

Different foods are prepared and the modifications in phenolic composition and effects on the most relevant properties are evaluated with regard to the quality of the food, its colour, texture, flavour, antioxidant capacity, provitaminic properties, etc.
### 3.3.2. TEACHING METHOD:

#### Learning Activities

| * Lecture hall presentations | in which the professor transmits the most relevant information on each topic. They are participative and encourage the active intervention of students through open questions, and discussion of uncertainties, etc. |
| * Practical laboratory classes and food pilot plant: | |
| * Seminars: individual work and/or group work related to: | |
| 1. - Presentation of treatment and discussion of the results in the course of the practical classes, which is also compiled in a report. | |
| 2. - Bibliographic work consisting of the search for information on a specific topic/process/compound and the preparation of brief summary and presentation of most relevant information brought to light. | |
| 3. - Scientific Seminars: conferences given by guest speakers on topics related to the subject module followed up with roundtable discussions. | |
| * Private study | |
| The student also has the possibility of: | |
| Personal tutorials, as arranged by each teacher on the course, during which the student can resolve any doubts. | |
| Resolution of practical cases and questionnaires - specially drawn up for a twofold reason, to be used by the students as a vehicle for directing their studies; developing their reasoning, correlating knowledge and actions, etc., and as useful aids in the self-assessment of each student's preparation and command over the subject matter. | |

#### ECTS credit allocations (Approximate Student workload in hours):

| A.- Formal classes | 8 |
| B.- Practical classes | 16 |
| C.- Directed teaching activities | 15 |
| D.- Others | 38 |
| **Total Hours - On Site:** | **24** |
3.3.3. CRITERIA AND ASSESSMENT METHOD

The main evaluation criteria is that the student can demonstrate:

- satisfactory knowledge of the subject matter
- a satisfactory level of related skills

As is standard practice in the Spanish educational system, marks are awarded on a scale of 10 points.

Evaluation is carried out by applying the following methodologies:

Evaluation of the "practical work":

This is carried out by continuous assessment of the students' work during the studies related to the practical credits, taking account of performance, working and operating methods in the laboratory and the pilot plant, integration in the phases of group work, etc.

In addition, the task of interpreting and discussing data, compiled in the relevant report and presented at the seminar will also be marked.

This section will score a maximum of 3 points (out of 10).

Evaluation of data research and interpretation skills, etc.

These skills will be evaluated through the preparation of a bibliographic work, which as set out in the section on seminars, will involve the preparation of a report and a presentation, in public, of the work carried out.

This activity will score a maximum of 2 points (out of 10).

Passing a written test on the resolution of practical situations.

Students must demonstrate the knowledge they have acquired and their capacity to apply it to the resolution of various problems or in different scenarios. This test will also demonstrate their ability to summarise and to identify the essential and most important aspects, as well as their ability to draft reports and discuss data.

The test will be marked out of a total of 5 points.

The final mark will be average mark given over the three above-mentioned activities.

3.3.4. LEARNING RESOURCES

The following resources are available to support student learning:

1.- In the workshops: audiovisual material that adds pace to the formal classes, making them more dynamic and attractive, as they allow the teacher's presentation to be complemented by figures, graphs, photographs, and even demonstration videos. Slide projectors, retro-projectors, computers and LCD projectors, the latter being increasingly used because of their versatility and the wide range of options they offer.

2.- Laboratory and food pilot plant: Appropriate industrial and analytical equipment is available to provide a satisfactory training in the processing and preparation of foodstuffs, as well as the analysis of the study of the physico-chemical sensorial and nutritional properties, etc.
Pilot plants are available for the processing of vegetables (conserves, marmalades, lyophilisation, gamma irradiation and modified atmosphere conservation, etc.); food pilot plant for cereal-derived products (bread and bakery products); pilot plant for the preparation of alcoholic drinks (wine, beer, cider, etc) and non-alcoholic (juices).

As well as the standard equipment available in all laboratories such as phmeters, burettes, etc. for analytical purposes, also available are spectrophotometers, chromatographs, and specific instruments for sensorial properties a texture meter, colour meter, electronic nose, viscosimeter, turbidimeters, etc. as well as a tasting room with 21 standardised booths.

3.- Computer room and library: The faculty has its own library where there is a wide collection of books and scientific reviews related to the subject module. Furthermore, students can gain access to a wide range of information in electronic formats, through software applications (UBUCAT) available to the university community: books, magazines, databases, etc. To do so, as well as the computers that are available in the library, there is an information hall for the use of students.

Another interesting resource is the electronic platform (UBUNET) that functions on the university intranet, and through which students can remain in constant contact with their teachers, can exchange teaching material, questionnaires, reports, and follow up tutorials, etc.

4.- Personalized attention: The numbers of students per group allows for close working relationships, which also contributes to the tutorial system in place at the Faculty of Sciences that manages the allocation of an academic tutor for all students enrolled at the Faculty. The academic tutor holds periodic meetings with students, with a view to helping them in their learning, their study plan, etc.

Moreover, all university lecturers have set timetables for teaching tutorials during the academic year to attend to students and help them in their training and learning processes.

3.3.5. LANGUAGE
The subject module is taught in Spanish, although the consultation and use of information written in other languages, especially in English, is highly recommended. Training in other languages and especially English is positively considered, as this is a universal language for scientists and, in general, the language in which the most recent scientific information is published.

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**COURSE**

**CODE**

| DESIGN OF FUNCTIONAL FOODS | 5241 |

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<tr>
<th>Tuition Period (semester)</th>
<th>Duration (in months)</th>
<th>Type (Mand/Op)</th>
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<th>Hours (practical)</th>
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**LECTURER IN CHARGE OF COURSE (1)**

- **Family Name and First Name**: Isabel Jaime Moreno
- **University**: University of Burgos
- **Department**: Biotecnología y Ciencia de los Alimentos
- **Area**: Tecnología de los Alimentos
- **Room no.**: 114
- **Phone (extension)**: 947258814
- **e-mail**: ijaime@ubu.es

**LECTURER (2)**

- **Family Name and First Name**: María Luisa González San José
3.3.1. SPECIFIC EDUCATIONAL OBJECTIVES

OBJECTIVES:

In relation to knowledge:

The aim is that students deepen their knowledge of functional foods:

- their preparation
- legal requirements
- properties

The course contents are grouped around types of functional foods, stressing the:

- ingredients/compounds with beneficial activities
- possible interactions with other components
- effects on physico-chemical and sensorial properties

It is intended to build up knowledge of the design or development of this type of food, to explore the guidelines that should be followed and the factors to be taken into account.

In relation to abilities and skills:

In relation to the development of functional foods, the aim is for the student to:

- Design/develop/control processes and/or the related conditions
- Develop analytical and evaluative skills
- Discern elemental characteristics
- Develop a critical awareness of results
- Gain an awareness of quality indicators
- Improve their ability to identify and interpret specific information

The student will develop skills related to:

- the presentation of results
- processes
- planning activities
- rapid and logical responses to the subject matter.
- ability to draw up concise and well-structured reports
SUMMARY OF PROGRAMMATIC CONTENT:

THEORETICAL:

Topic 1: Introduction, Definition and concept of functional food.

A. Sources of compounds with functional activity.
   Topic 2: Compounds of vegetable origin.
   Topic 3: Microorganisms with functional activity.
   Topic 4: Bioactive peptics.
   Topic 5: Bioactive lipids.

B. Types of functional foods.
   Topic 6: Non-alcoholic drinks. Refreshments, energy drinks and sports drinks.
   Topic 7: Cereal-derived products.
   Topic 8: Dairy products.
   Topic 9: Meat products.
   Topic 10: Other products.

C. Commercialisation of functional foods.
   Topic 12: Functional foods and the consumer.

PRACTICAL OR EXPERIMENTAL:

7. Preparation of different foods in a traditional and “functional” way (examples: cooked sausages and fresh cheese in which the lipid fraction is modified; phenolic-enriched fruit juice fractions; bakery products enriched with fibre; among others). The study of the principal “functional” foods and their effect on composition and sensorial and physico-chemical properties.

2. The influence of ingredients with functional properties on food conservation.

3.3.2. TEACHING METHOD:

Learning Activities

This subject module is proposed with **3 ECTS credits**, which is equivalent to 75 hours of work per student, applying a conversion factor of 25 hrs per credit. The distribution of learning hours and ECTS credits on the subject module is structured as follows: Theory: 20h (ECTS 0.8); Practicals: 18h (ECTS 0.7); Personal Work: Full-time Study (20h) (ECTS 0.9) and other activities (15h) (ECTS 0.6).

The teaching methodology to be used for the learning activity and its values in hours and ECTS credits is set out below:

* **Lecture hall presentations** in which the teacher conveys the most relevant information on each topic. They are participative and encourage the active intervention of students through open questions, and discussion of uncertainties, etc. 20 hrs (formal teaching)

* **Practical laboratory classes** and food pilot plant:

Resolution of practical situations related to preparation and processing systems, food properties, etc., which help in the preparation of the practical sessions 4 hrs (formal teaching)

Work in the food pilot plant. Different foodstuffs are prepared following a traditional and “functional” formulation, evaluating the alterations that take place in their physico-chemical, sensorial, nutritional properties, etc. 14 hrs (formal teaching)

* **Seminars**:

Students will prepare seminars related to individual and/or group work on:
1.- Presentation of treatment and discussion of the results in the course of the practical classes, which also involves the preparation of a report. 
2 hrs (formal presentations); 4 hrs (private study)

2.- Bibliographic work consisting in the search for information on a specific topic/process/compound and the preparation of a brief summary and a presentation on the most relevant information found.

2 hrs (formal presentations); 4 hrs (private study)

3.- Scientific Seminars: conferences given by guest speakers on topics related to the subject module followed up with round table discussions. 3 hrs (formal teaching)

* Private study 20 hrs
The student is offered the possibility of direction/help in the private study through:
Personal tutorials, to resolve any doubts during the tutorials arranged by each teacher on the course.

Questionnaire. - Questions are made available to the students relating to the subject module that, if mastered, they should be able to answer. The utility of these questionnaires is twofold: they are proposed as a means of directing their study, developing their reasoning ability, correlating knowledge and actions, etc.; and they serve the purpose of self-assessment and self-appraisal on the degree to which the student has assimilated the subject matter.

ECTS credit allocations (Approximate student workload in hours):

<table>
<thead>
<tr>
<th>ECTS Credit Allocation</th>
<th>Hours</th>
</tr>
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<tbody>
<tr>
<td>Lectures / Teacher directed discussion</td>
<td>12</td>
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<tr>
<td>Practical Classes (and laboratory notebook compilation)</td>
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<tr>
<td>Seminars:</td>
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**On Site - Total Hours:** 24

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<tr>
<td>Workload to prepare theoretical and/or practical classes</td>
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<td>Resolution of exercise, practical cases and questionnaires</td>
<td>15</td>
</tr>
<tr>
<td>Workload to prepare exams and/or evaluation tests</td>
<td>9</td>
</tr>
<tr>
<td>Critical Works on Scientific Publications</td>
<td></td>
</tr>
</tbody>
</table>

**Off Campus - Total Hours:** 51

**WORKLOAD TOTAL HOURS:** 75

3.3.3. CRITERIA AND ASSESSMENT METHOD
The main evaluation criteria are based on the student having demonstrated that he or she has acquired a satisfactory knowledge of the subject matter, as well as having developed an adequate level of related skills. All of this is marked out of 10 points, as is standard practice in the Spanish educational system.

These criteria are evaluated by the following methods:

- The evaluation of “practical work” is based on continuous assessment of the student’s work.
during the development of the practical credits. In addition, the work of interpreting that data and its discussion, which will be evident from the corresponding report and its presentation in a seminar, will also be marked. This section is worth 3 out of a possible 10 points.

- The demonstrating research skills for the identification, interpretation and, in necessary, the application of information, will be evaluated through the preparation of a bibliographic work, as mentioned above. This activity scores a maximum of 2 of a total of 10 points.

- Passing a written test on the resolution of practical situations. This test will be marked out of a total of 5 points.

The final mark will be the sum of the marks given for the three above-mentioned activities.

3.3.4. LEARNING RESOURCES

The following resources are available to support student learning:

1.- In the workshops: audiovisual material that allows a more dynamic pace to the formal classes making them more dynamic and attractive as they allow the teacher's presentation to be complemented by figures, graphs, photographs, and even demonstration videos. Slide projectors, retro-projectors, computers and LCD projectors, the latter being increasingly used because of their versatility and wide range of options.

2.- Laboratory and food pilot plant: Appropriate industrial and analytical equipment is available to provide a satisfactory training in the processing and preparation of foodstuffs, as well as the analysis of the study of the physico-chemical sensorial and nutritional properties, etc.

Pilot plants are available for the processing of vegetables, the preparation of cereal-derived products (bread and bakery products); the preparation of alcoholic drinks (wine, beer, cider, etc) and non-alcoholic (juices); the preparation of meat products (crude, cured, cooked, etc), and the preparation of dairy products (milk, cream, cheese, etc.).

As well as the standard equipment available in all laboratories such as phmetres, burettes, etc. for analytical purposes, also available are spectrophotometers, chromatographs, and specific instruments for sensorial properties: texture meters, colorimeters, electronic noses, viscosimeters, turbidimeters, etc.; and a tasting room with 21 standardised booths.

3.- Computer room and library: the faculty has its own library where there is a wide-collection of books and scientific reviews on the contents of their subject module. Furthermore, through software applications (UBUCAT) available to this university community, students can gain access to a wide range of information in electronic formats: books, magazines, databases, etc. To do so, as well as the computers that are available in the library, there is an information hall for the use of students.

Another interesting resource is the electronic platform (UBUNET) that functions on the university intranet, and through which students can remain in constant contact with their teachers, can exchange teaching material, questionnaires, reports, and follow up tutorials, etc.

4.- Personalized attention: the numbers of students per group allows a close working relationship within them, which also contributes to the tutorial system in place at the Faculty of Sciences, which manages the allocation of an academic tutor to all students enrolled at the Faculty. The academic tutor holds periodic meetings with students, with a view to helping them in their learning, their study plan, etc.

Moreover, all professors have set timetables for teaching tutorials during the academic year to attend to students and help them in their training and learning processes.

3.3.5. LANGUAGE

The subject module is taught in Castilian Spanish, although the consultation and use of information written in other languages, especially in English, is recommended.