

**COURSE DATA****Data Subject**

<b>Code</b>	33989
<b>Name</b>	Food Additives
<b>Cycle</b>	Grade
<b>ECTS Credits</b>	4.5
<b>Academic year</b>	2021 - 2022

**Study (s)**

<b>Degree</b>	<b>Center</b>	<b>Acad. year</b>	<b>Period</b>
1103 - Degree in Food Science and Technology	Faculty of Pharmacy and Food Sciences	4	First term

**Subject-matter**

<b>Degree</b>	<b>Subject-matter</b>	<b>Character</b>
1103 - Degree in Food Science and Technology	37 - Food additives	Optional

**Coordination**

<b>Name</b>	<b>Department</b>
GAMERO LLUNA, MARIA DESAMPARADOS	265 - Prev. Medicine, Public Health, Food Sc., Toxic. and For. Med.

**SUMMARY**

Food Additives is an elective subject at fourth course of Food Science and Technology, which is taught in the Faculty of Pharmacy, University of Valencia. This course has a total of 4.5 ECTS taught in the first quarter.

Food additives are a basic and indispensable tool in food manufacturing. Today, there is a wide variety of additives and without them would be practically impossible to obtain optimal food production with hygienic security guarantees and quality standards that currently are required. Among the most important groups of additives, there are antioxidants, antimicrobials, colorants, sweeteners, flavor enhancers, thickener and gelling agents, emulsifiers, etc. The overall objective of the subject is precisely to present the different types of additives and processing aids used in the food industry as well as their roles and rules of use. Therefore most of the course is devoted to describing the composition, characteristics, most important roles in food and rules of use of each of the additive groups above mentioned. In addition, the graduate in Food Science and Technology must have knowledge about general questions, such as the definitions of additive and processing aid and learn to differentiate them. Another objective of this course



is to provide knowledge about the toxicology studies leading to additive authorization, issues of safety and labeling and other issues surrounding the legislation of additives. Thus the subject of food additives listed as one of the educational content of interest that must exist within the degree of Food Science and Technology.

## PREVIOUS KNOWLEDGE

### Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

### Other requirements

To study this subject is of interest to have basic knowledge of food chemistry and biochemistry that will allow understand the theoretical concepts of food additives, their composition and mode of action and their participation in food processing.

## OUTCOMES

### 1103 - Degree in Food Science and Technology

- Know the role of food additives in the design and innovation of new food ingredients, products and processes.
- Know the additives arising from new knowledge on their natural sources or resulting from food biotechnology.
- Know the methods used for the manufacture of additives.
- Know the toxicological aspects of additives.
- Know legislation on additives.

## LEARNING OUTCOMES

### SKILLS TO ACQUIRE

Understand and critically evaluate the role of food additives in the design and innovation of new ingredients, food products and processes.

Understand and critically evaluate the general aspects of the use of additives and processing aids such as definitions and classification of additives and processing aids



Knowing the composition, physicochemical characteristics and the most important functionality of the different types of permitted additives and processing aids in food processing and manufacturing.

To know toxicological studies required for the authorization of additives, use legal criteria, safety aspects, positive lists, labeling agencies to perform these functions as well as other issues related to additives legislation.

#### **SOCIAL SKILLS AND ABILITIES**

Critical thinking that allows them to argue and defend judgments with integrity and tolerance.  
Ability to work individually and in groups, in concert.

Ability to apply knowledge to practice.

Ability to build a written or an oral form understandable and organized

## **DESCRIPTION OF CONTENTS**

### **1. Introduction**

Topic 1. Introduction to the subject. Some milestones of the use of food additives. Definitions of additive and processing aid and differences. Benefits of the use of additives. Conditions of employment and food security.

Topic 2. Biotechnological synthesis of additives. Main microorganisms producers of additives. Bioreactors and processes.

### **2. Additives for conservation**

Topic 3. Antioxidant additives. Autoxidation: autoxidation reactions, preventive measures. Classification of antioxidants: natural and synthetic. Applications and examples.

Topic 4. Additives antimicrobials. General comments. Classification of preservatives, mineral and organic preservatives. Applications and Examples.

Topic 5. pH control agents. General comments. Additives used as pH control agents and classification. Applications and examples.

Topic 6. Additives used in bakery. General comments. Types o additives used in bakery: emulsifiers, wetting agents and enzymes. Applications and Examples



### **3. Additives for organoleptic effects**

Topic 7. Flavorings and flavor enhancers. Overview flavorings. Classes flavors: natural, concentrated aromas, synthetic nature-identical and synthetic. Biotechnological advances in the production of aromas. Overview of flavor enhancers. Classes flavor enhancers. Applications and examples.

Topic 8. Sweeteners. Overview sweeteners. Types of sweeteners: nutritive and low-power sweeteners no nutritive and high-power sweeteners. Applications and examples.

Topic 9. Dyes. Overview dyes. Classification of dyes: natural, synthetic but identical to naturals, natural extracts and synthetic. Applications and examples.

Topic 10. Thickeners and gelling agents. General comments. Classification: seaweed extracts, seed extracts, plant extracts, extracts of cereals, vegetable products extracts, extracts of microorganisms. Cellulose derivatives. Applications and examples.

Topic 11. Emulsifiers. General comments. Classification: natural and semi synthetic. Applications and examples.

### **4. Manufacturing aids. Enzymes**

Topic 12. Manufacturing aids. Enzymes. General comments and classification of manufacturing aids. Enzymes. Health and legal aspects of using enzymes. Applications of enzymes in the food industry.

### **5. Toxicological evaluation and legislation**

Topic 13. Toxicological evaluation. Justification for the use of additives: the need and safety. Toxicological evaluation of additives. Daily intake (ADI). Labelling. Examples of additives questioned.

Topic 14. Legislation on food additives. Positive lists. Directives, royal decrees and regulations.

Topic 15. Employment of additives in the different sectors of food industry. Meat industry, dairy industry, bakery industry, post-harvest industry.

### **6. Practicals**

PRACTICAL 1.

USE OF THICKENERS AND GELLING AGENTS. Stabilization of emulsions. Synergies between hydrocolloids. Development of a product like a sweet pastry.

PRACTICAL 2. DETERMINATION OF ADDITIVES IN FOOD. Rapid detection of preservatives and adulterants in milk. Determination of ascorbic acid (vitamin C) on flour. Determination of sulfites in meat.

PRACTICAL 3.

MAILLARD REACTION OF SUCROSE, GLUCOSE AND FRUCTOSE ON FLOUR. Variations in color



intensity.

#### PRACTICAL 4.

PREPARATION OF CANDIES. Preparation of jelly beans and other candies.

PRACTICAL 5. ASSESSMENT OF PRESERVATIVE IN FOODS. Determination of nitrate and nitrite in vegetables

PRACTICAL 6. FOOD COLOURS. Dyes wine. Arata assay. Determination of natural colorants. E-160a. Identifying dyes by thin layer chromatography (TLC)

### WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	25,00	100
Laboratory practices	15,00	100
Seminars	2,00	100
Tutorials	1,00	100
Development of group work	10,00	0
Development of individual work	5,00	0
Study and independent work	10,00	0
Readings supplementary material	5,00	0
Preparation of evaluation activities	20,00	0
Preparing lectures	10,00	0
Preparation of practical classes and problem	7,50	0
<b>TOTAL</b>	<b>110,50</b>	

### TEACHING METHODOLOGY

The theoretical teaching methodology is based on the delivery of lectures along with the performance, presentation and defense of individual and collective reports. Individual study of the topics above will be strengthened by organizing tutorials. Prior to the date of tutoring, the student must have prepared the proposed activities to reinforce the learning aspects specific agenda. The seminars are group work that will include the delivery of a report on the subject of work and a public exhibition in the classroom.

The **seminars** are team work that will include the delivery of a report on a working topic that relates the Sustainable Development Goals (SDGs) to the contents of the course and a public presentation in the classroom. Examples of the applications of the subject content in relation to the SDGs will be given, thus providing students with the knowledge, skills and motivation to understand and address the SDGs, while promoting reflection and critique.





During practice, students can extend and implement the knowledge. It will be distributed a booklet of practices with the necessary materials and the development of each of the perfectly organized practices. The teacher will monitor the practice, will address the doubts in the implementation and provide guidance on how to make reports, organizing results and conclusions

## EVALUATION

- a) Production, presentation and defense of works related to the contents explained and discussed in the classroom related to one of the subjects studied during the semester (**coordinated seminars**). Written work will be evaluated and the level of understanding of the content and skills to their exposure, advocacy and discussion (10%).
- b) To make a **written test** to ensure knowledge and understanding of theoretical minimum content established for the subject (60%).
- c) Evaluation of **laboratory** work by teacher supervision, the ability to solve experimental problems and, eventually, the ability to make very detailed and organized reports of experimental results. The written test will include questions about practical contents (20%).
- d) Evaluation of the work during the **tutorials** and the ability to solve the proposed activities (10%).

In order to pass the subject is necessary to obtain minimum 4.5 points out of 10 on the written test and that the global mark is minimum of 5 points out of 10.

Attendance at practices is obligatory for passing the subject except for those students that have undertaken these classes previously. Unjustified non-attendance to tutorials and coordinated seminars imply zero points in the corresponding evaluation section except for those students that have undertaken these classes in previous years.

## REFERENCES

### Basic

- Ash, M. y Ash, L. (2008). Handbook of Food Additives. Ifis, New York
- Barbosa-Cánovas, G. y col. (1999). Conservación no térmica de alimentos. Ed. Acribia. Zaragoza.
- Barros Santos, C (2009). Los aditivos en la alimentación de los españoles y la legislación que regula su autorización y uso. Visión Libros. Madrid.
- Branen, L.A., Davidson, P.M., Salminen, S. (1999). Food additives. Marcel Dekker, Inc., New York and Basel.
- Cabal, E. (1999). Guía de los aditivos usados en alimentación. Mandala ediciones. Madrid
- Calvo, M. (1991). Aditivos alimentarios. Propiedades, aplicaciones y efectos sobre la salud. Ed. Librería General. Zaragoza
- Cubero, N (2002). Aditivos alimentarios. Mundi Prensa, Madrid
- Elmadfa I., Muskat E., Fritzsche D. (1999). Guía de los aditivos, conservantes y colorantes. RBA Libros.
- Madrid, A. (1987). Manual de utilización de los aditivos en alimentos y bebidas. AMV Ediciones.



Madrid.

Madrid, A. (2000). Los aditivos en los alimentos. AMV: Mundi Prensa, Madrid.

Multon, J.L., Lepetre, F. (2000). Aditivos y auxiliares de fabricación en las industrias alimenticias. Ed. Acibia, Zaragoza.

Organización de consumidores y usuarios (2005). ¿Veneno en su plato? Usos y riesgos de los aditivos alimentarios. OCU Ediciones, Madrid

Saltmarsh M. (2008). Essential Guide to Food additives. RSC Advancing the chemical sciences.

Sanz Pérez B. (1999). Aditivos alimentarios. Ed Everest.

### **Additional**

- Andrée Voilley and Patrick Etievant.(2006) Flavour in Food. CRC Press
- Ashurst, P.R. (1995). Food Flavours. Blackie Academic and Professional
- Attokaran, M (2012). Natural food flavors and colorants. Blackwell Publishing
- Bell, G.A; Watson, A.J.(1999). Tastes and Aromas. UNSW Press
- Boletín Oficial del Estado (BOE), (2001). Código Alimentario Español (4. Edición actualizada). Madrid.
- Clydesdale, FM.(1996). Food Additives: Toxicology, Regulation, and Properties. CRC press
- Davidson, P.M; Sofos, J.N, Branen, A.L (2005). Antimicrobials in Food. Taylor and Francis
- Dickinson, E and Vliet TV (2002). Food Colloids. Biopolymers and Materials. RSC
- Dickinson, E and Leser M.E (2006). Food Colloids. Self-Assembly and Material Science. RSC Publishing
- FAO/OMS. (1997). Comité Mixto de Expertos en Aditivos Alimentarios. Ginebra. Guía Práctica. Aditivos, Conservantes y Colorantes. Ed. Obelisco. Barcelona
- O'Donnell K, Kearsley M (2012). Sweeteners and Sugar Alternatives in Food technology. Blackwell Publishing
- Santos Buelga, C; Escribano-Baylon MT; Iltanzio, V. (2010) Recent advances in polyphenol research, Volume 2. Blackwell Publishing
- Rousell, N.J and Gould, G.W. (2003). Food Preservatives. Kluwer Academic/Plenum Publishers
- Watson, D.H.(2002). Food Chemical Additives. CRP Press.

## **ADDENDUM COVID-19**

**This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council**

### **3. Teaching methodology**

Theory: a hybrid teaching methodology is proposed, combining classroom classes (provided public health conditions are favourable) with video conferences using the tool *Blackboard Collaborate* (BBC). These video conferences will be mainly carried out in synchronous modality according to subject schedule.



Slides used by the professor during theory classes will be uploaded to Virtual Classroom.

Continuos assessment: diverse activities will be settled during the quarter, tasks/questionnaires with deadlines or participation in debates/discussion forums through Virtual Classroom. These activities will be commented during theory classes.

Practices: in case of lab capacity limitations prevent the developing of the totality of the practices, the undone practices will be substituted by audiovisual material and/or practical cases.

Tutorial: it will be done in face-to-face modality, provided public health conditions are favourable.

Seminars: they will be carried out through BBC video conferences. The monitoring of the development of reports corresponding to the subject will be done by the professor through e-mail and BBC video conferences.

Tutorials for doubts resolution: they will be carried out through e-mail (attention in maximum 48 h working days) or BBC video conferences.

#### **4. Evaluation**

The theory exam ponderation over final mark is reduced, changing from 60% to 50%.

A specific evaluation parameter called “continuous assesment” is created, with a 10% ponderation over final mark. This parameter includes marks correspondent to the assesment of proposed tasks and questionnaires and participation in debates/discussion forums during the quarter.

The remaining assesment parameters kept their ponderations indicated in the Teaching Guide. The subject’s evaluation criteria remained the same as in the Teaching Guide.

Final exam (theory and practices) will be carried out in face-to-face modality, except public health conditions forces to on-line evaluation. In this case, a questionnaire will be done (test, short questions, practical cases) through Virtual Classroom. If any student does not have the means to establish this connection, he/she will have to contact the professor as son as this option is announced.