

SUBJECT GUIDE

FUNDAMENTALS OF FOOD SCIENCE

MODULE	CONTENT	YEAR	TERM	CREDITS	TYPE
Food Science	Fundamentals of Food Science	1st	2nd	6.0	Mandatory
<b>LECTURER(S)</b>			<b>Postal address, telephone n°, e-mail address</b>		
<ul style="list-style-type: none"> <li>Silvia Pastoriza de la Cueva</li> <li>Miguel Navarro Alarcón</li> <li>Marina Villalón Mir</li> </ul>			Department of Nutrition and Food Science, 3rd floor, School of Pharmacy, Office 318 and 320. Phone number: 958 249766 / 958 242841 email: <a href="mailto:spdelacueva@ugr.es">spdelacueva@ugr.es</a> , <a href="mailto:nalarcon@ugr.es">nalarcon@ugr.es</a> and <a href="mailto:marinavi@ugr.es">marinavi@ugr.es</a>		
<b>DEGREE WITHIN WHICH THE SUBJECT IS TAUGHT</b>					
Human Nutrition and Dietetics					
<b>PREREQUISITES and/or RECOMMENDATIONS (if necessary)</b>					
Having studied the subject of General Chemistry					
<b>BRIEF ACCOUNT OF THE SUBJECT PROGRAMME (ACCORDING TO THE DEGREE¿?)</b>					
<ul style="list-style-type: none"> <li>Classification, chemical composition and nutritive value of food.</li> <li>Physic-chemical and functional properties of food.</li> <li>Sensory analysis of food.</li> </ul>					
<b>GENERAL AND PARTICULAR ABILITIES</b>					
<ul style="list-style-type: none"> <li>To develop the profession with respect to other health professionals, acquiring skills to work as a team.</li> <li>To recognize the need to maintain and upgrade professional skills, with particular emphasis on learning, independently and continuously, new knowledge, products and techniques in food and nutrition and motivation for quality.</li> <li>To conduct effective communication, both orally and in writing with people, health professionals or industry and the media, knowing use of information technologies and communication, particularly those related to nutrition and habits of life.</li> <li>To identify and classify foods and by-products. Knowing how to analyze and determine their composition, properties, nutritional value, the bioavailability of nutrients, organoleptic characteristics and the modifications suffered as a result of technological and culinary processes.</li> <li>Knowing and applying the basics of chemical composition analysis and sensory food products.</li> </ul>					
<b>OBJECTIVES (EXPRESSED IN TERMS OF EXPECTED RESULTS OF THE TEACHING PROGRAMME)</b>					



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- Training in technical aspects of the student in food science, health and food legislation.
- To study the food components according to their definition, structure, classification, functions and sources.
- To know and interpret the legal framework applied to food.
- Addressing the mechanisms of alteration and preservation of food.
- To specify the importance of food free water (water activity) in the storage and processing technology and its relationship with the spoilage reactions.
- Justifying the importance of the use of food additives for the food industry.
- Studying the main groups of food additives used.
- Addressing the structure and its relation to the composition and nutritional value of the major food groups of animal origin.
- Knowing the main features and components of the new food.
- To acquire skills in handling and use of bibliographic sources, contributing to the development of reasoning and intellectual work of the student, and group work.
- Motivation of the student in learning the Basics of Food Science, gaining an overview of the whole discipline, to their preparation in the future study of problems not directly covered in the teaching period.

## **DETAILED SUBJECT SYLLABUS**

### **THEORETICAL PROGRAM**

1. INTRODUCTION. Food Science. Concept. Objectives. Historical development. Current status and prospects. Food law. Concept of food. Classification of food. Novel foods: functional, transgenic, ecological and dietetic products.
2. CARBOHYDRATES. General functions in foods. Bromatological classification. Properties in foods.
3. LIPIDS. General functions in foods. Bromatological classification. Properties in foods.
4. PROTEIN. General functions in foods. Bromatological classification. Denaturation. Functional properties.
5. VITAMINS. General functions in foods. Structure and forms. Stability and forms of degradation.
6. MINERALS. General functions in foods. Speciation and food supplementation. Influence of processing on mineral content of foods.
7. BROMATOLOGICAL STUDY OF WATER. Bromatological concept of water activity. Bromatological applications of water activity. Influence of the water activity in the food stability.
8. ALTERATION OF FOOD. Overview. Classification. Influencing factors.
9. ALTERATION OF LIPID. Chemical oxidation of lipids: substrates, regulatory factors and prevention. Enzymatic alterations of lipids: lipid oxidation by lipoxygenase, ketonic rancidity and hydrolytic rancidity. Reversion of edible oils. Polymerization of lipids.
10. OTHER FOOD ALTERATIONS. Chemical browning: substrates, regulatory factors, prevention and effects. Enzymatic oxidation: substrates, responsible enzymes, reaction mechanism, prevention and effects. Other enzymatic alterations of food.
11. FOOD ADDITIVES. Overview. Definition of food additive and processing aid. Classification. Justification for the employment of food additives. Health risks associated with the use of additives. Toxic risk assessment consistent with the use of additives. EC directives and legal use of additives. Dyes. Flavor modifiers. Flavorings. Stabilizers of physical characters. Chemical preservatives.
12. - FOOD PRESERVATION. General principles of food preservation. Physical methods of preservation. Applying of heat or cold to food preservation. Drying. Dehydration and lyophilization. Ionizing radiation. Applications. Thermal emerging technologies.
13. - CHEMICAL METHODS OF PRESERVATION. Salting, smoking, brining, pickling. Natural chemical preservatives: vinegar, sugar and alcohol. Additives. Biological conservation. Combined methods: hurdle technology, cooking under vacuum (vide suos technology).
14. SENSORY PROPERTIES OF FOOD. Introduction. The color of the food. The flavor of food. The smell of the food. The texture of food. The flavor of food.
15. BASIC PRINCIPLES OF SENSORY ANALYSIS. Introduction. Concept. Objectives. Description of color,



odor, flavor and texture.

16. **FOOD QUALITY.** Concept of quality. Quality in the food industry. Systems of quality assurance. Reference standards. Quality criteria. Evaluation of quality in food.

17. **MEAT AND MEAT PRODUCTS.** Structure and chemical composition of the meat muscle. Post-mortem changes: influence of exercise on the maturation of the meat. Rigor mortis. Analytical criteria and health.

18. **FISH AND PRODUCTS.** Species of fish consumption. Meaning in the diet. Composition. Seafood and shellfish consumption. Canned fish. Fish products. Analytical criteria and health.

19. **EGGS AND EGG PRODUCTS.** Structure and chemical composition. Egg products. Analytical criteria and health.

20. **MILK AND DAIRY PRODUCTS.** Structure and chemical composition of the milk. Types of milk, fermented milks and modified milks. Analytical criteria and health. Milk from other animal species important for human consumption.

21. - **CHEESE.** Chemical composition. Classification. Analytical criteria and health.

### **PRACTICAL PROGRAM**

**PRACTICE 1. GENERAL MANAGEMENT LABORATORY.** Learning to use volumetric glassware and necessary apparatus for the development of practices. Reminder of the fundamentals of the titrations to be used for calculations after food analysis performed: problem solving.

**PRACTICE 2. MOISTURE IN FOOD.** Determination of moisture in cooked ham and milk.

**PRACTICE 3. FAT CONTENT IN MEAT DERIVATIVES.** Extraction by the Soxhlet method and determination of fat content. Identification of the fatty acid composition by gas chromatography.

**PRACTICE 4. CARBOHYDRATES.** Determination of lactose in milk.

**PRACTICE 5. MINERALS.** Assessment of water hardness, assessment of Ca<sup>2+</sup> and Mg<sup>2+</sup> rating.

Determination of phosphorus in milk.

**PRACTICE 6. FOOD ADDITIVES.** Determination of natural dyes by thin layer chromatography. Determination of sulfites in white wine. Evaluation of nitrate content in ham.

**PRACTICE 7. ALTERATIONS.** Measuring the acidity of milk.

**PRACTICE 8. SENSORY ANALYSIS.** Texture profile.

### **READING**

#### **• KEY LITERATURE**

- QUÍMICA DE LOS ALIMENTOS, 2ª Edición. BELITZ, H. D.; GROSCH, W. Editorial Acribia, S. A. Zaragoza 1997.
- ALIMENTOS: composición y propiedades. ASTIASARÁN ANCHÍA, I; MARTÍNEZ HERNÁNDEZ, J. A. Editorial McGraw-Hill Interamericana. Madrid 2000.
- CIENCIA BROMATOLÓGICA: principios generales de los alimentos. BELLO GUTIÉRREZ, J. Editorial Díaz de Santos, S. A. Madrid 2000-
- FOOD CHEMISTRY, 4th revised and extended revision. H. D. Belitz, W. Grosch, P. Schieberle. Springer-Verlag, Leipzig, 2009.
- QUÍMICA DE LOS ALIMENTOS, 4ª edición. Baduí Dergal, S. Editorial Pearson, México, 2006.
- NUTRICIÓN Y ALIMENTACIÓN. MATAIX, J. Editorial Ergon. Majadahonda (Madrid), 2009.
- TRATADO DE NUTRICIÓN, 2ª edición: tomo I (Bases fisiológicas y bioquímicas de la nutrición) y tomo II (Composición y calidad nutritiva de los alimentos). GIL, A. Editorial Médica panamericana. Madrid, 2010.

#### **• ADDITIONAL LITERATURE**



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- QUÍMICA DE LOS ALIMENTOS, 2ª Edición. FENNEMA, O. R. Editorial Acribia, S. A. Zaragoza 2000
- TOXICOLOGÍA ALIMENTARIA. Camean, A.M.; Repetto, M. Editorial Díaz de Santos, Madrid, 2006.
- QUÍMICA DE LOS ALIMENTOS, 3ª Edición. DAMODARAN S., PARKIN K. L., FENNEMA, O. R. Editorial Acribia, S. A. Zaragoza 2008.

#### RECOMMENDED INTERNET LINKS

- <http://www.nutricion.com>
- <http://www.laisla.com/uned/unitaria/com>
- <http://www.biosearchlife.es/pb/home.jsp#>
- <http://www.pulevasalud.com/ps/index.jsp>
- <http://www.puleva.es/pf/index.html>
- <http://www.nestle.es/web/index.asp>
- <http://www.AESAN>
- <http://www.EFSA>



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