

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

Code	33943
Name	Foodstuff Chemistry
Cycle	Grade
ECTS Credits	6.0
Academic year	2017 - 2018

Study (s)

Degree	Center	Acad. year	Period
1205 - Degree in Human Nutrition and Dietetics	Faculty of Pharmacy and Food Sciences	2	First term
1211 - Double Degree in Pharmacy and Human Nutrition and Dietetics	Faculty of Pharmacy and Food Sciences	2	First term

Subject-matter

Degree	Subject-matter	Character
1205 - Degree in Human Nutrition and Dietetics	11 - Food chemistry	Obligatory
1211 - Double Degree in Pharmacy and Human Nutrition and Dietetics	1 - Asignaturas obligatorias del PDG Farmacia-Nutrición Humana y Dietética	Obligatory

Coordination

Name	Department
GARCIA LLATAS, GUADALUPE	265 - Prev. Medicine, Public Health, Food Sc.,Toxic. and For. Med.
LAGARDA BLANCH, MARIA JESUS	265 - Prev. Medicine, Public Health, Food Sc.,Toxic. and For. Med.

SUMMARY

Food Chemistry is a compulsory subject that is taught with a load of 6 ECTS in the second year, first semester, the Degree on Human Nutrition and Dietetics (HND) and in the Double Degree (Pharmacy and HND). It is part of Module 2: Food Science, which includes other areas such as Food Science,

**Fundamentals of Food Technology and Technology Cuisine.**

For the physical-chemical (P-C) changes that can occur in foods and act on them, producing the desired changes, the first thing we need is to know the characteristics of its components. Food Chemistry studies the different substances that can become part of the food, its structure, characteristics, P-C properties and reactions that may be involved and their possible interactions with other food components. Therefore, nutrients are studied: water, carbohydrates, lipids, proteins, vitamins and minerals and other substances, no nutrients for the human organism in food, such as pigments, flavourings and food additives.

Given that foods derived from biological systems (the two main sources: animal and plant), they undergo an evolution in due time, in some cases at the same cellular metabolism. In addition, the transformation undergone during processing and / or storage of food requires a detailed study for each type of food, as their specific characteristics influence these stages.

In short, the subject of food chemistry deals with the study of:

- a) components of food: structure, PC properties, reactions.
- b) the changes incurred during processing and / or storage of food.

PREVIOUS KNOWLEDGE**Relationship to other subjects of the same degree**

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

Other requirements

Basic module subjects, mainly Physics and Chemistry (general and organic).

It is advisable to do concurrently the other courses of second year belonging to the module (Food Science and Fundamentals of Food Technology)

COMPETENCES (RD 1393/2007) // LEARNING OUTCOMES (RD 822/2021)**1205 - Degree in Human Nutrition and Dietetics**

- Reconocer los elementos esenciales de la profesión del dietista-nutricionista, incluyendo los principios éticos, responsabilidades legales y el ejercicio de la profesión, aplicando el principio de justicia social a la práctica profesional y desarrollándola con respeto a las personas, sus hábitos, creencias y culturas, con perspectiva de género.
- Know, judge and know how to use and apply the sources of information related to nutrition, food, lifestyles and health.
- Recognise one's own limitations and the need to maintain and update professional competence, with particular emphasis on independent and lifelong learning of new facts, products and techniques in the field of nutrition and food, and on motivation for quality.



- Realizar la comunicación de manera efectiva, tanto de forma oral como escrita, con las personas, los profesionales de la salud o la industria y los medios de comunicación, sabiendo utilizar las tecnologías de la información y la comunicación especialmente las relacionadas con nutrición y hábitos de vida.
- Identify and classify food and food products. Know how to analyse them and determine their composition, properties, nutritional value, bioavailability, organoleptic and sensorial characteristics and alternations resulting from technological and culinary processing.
- Adquirir la formación básica para la actividad investigadora, siendo capaces de formular hipótesis, recoger e interpretar la información para la resolución de problemas siguiendo el método científico, y comprendiendo la importancia y las limitaciones del pensamiento científico en materia sanitaria y nutricional.
- Desarrollar la profesión con respeto a otros profesionales de la salud, adquiriendo habilidades para trabajar en equipo.
- Be familiar with discipline-specific terminology.
- Know the physicochemical properties, chemical reactions and technological functions of the components of food.
- Determine the influence of physical and chemical factors on the components of food.
- Know how to apply the knowledge acquired to the preparation and preservation of food.
- Acquire the knowledge and skill needed to elucidate the causes of organoleptic and/or nutritional modifications of components and/or food.
- Acquire knowledge to design and/or improve food.

LEARNING OUTCOMES (RD 1393/2007) // NO CONTENT (RD 822/2021)

- To master the terminology of the subject
- Understand the effects of technological processes in the chemical properties of food components.
- Apply the knowledge acquired in the handling and storage of food.
- Evaluate possible causes of sensory changes and / or nutritional components and / or food.
- Apply the knowledge to design and / or improvement of food
- Know, appraise, manage and apply knowledge leading basic and specialized bibliographic sources and some sources for the dissemination of computer-related issues of food chemistry.
- Acquire the ability to synthesize and organize properly, the information obtained from various sources.
- Be able to adequately express, both orally and in writing, the knowledge gained and relate them with previous ones.
- Know how to apply scientific rigor in the laboratory and in the problems.
- Have the ability to prepare reports of studies related to the subject.



DESCRIPTION OF CONTENTS

1. Study of food components: structure, physical-chemical properties, reactions in foods.

- Item 1. Food Chemistry. Concept. Relationship with other subjects. Bibliography.
- Item 2. Water. Physical constants and structures of water and pure ice. Water-solute interactions. Water activity and alterations in foods.
- Item 3. Carbohydrates. Classification. Starch and modified starches.
- Item 4. Browning in foods I. Classification. Caramelisation and ascorbic acid degradation.
- Item 5. Browning in foods II. Maillard reaction.
- Item 6. Components of dietary fiber. Functional properties of carbohydrates.
- Item 7. Lipids. Physical properties of fatty acids and fats.
- Item 8. Lipid alterations. Classification. Lipid oxidation. Other lipid alterations. Frying process.
- Item 9. Modifications of fats and oils. Functional properties of lipids.
- Item 10. Proteins. Modifications of proteins during processing and storage. Functional properties.
- Item 11. Enzymes. Classifications and action in foods. Enzymatic browning.
- Item 12. Minerals and hydrosoluble vitamins: Modification of mineral content during food processing. Hydrosoluble vitamins. Structures and stability.
- Item 13. Liposoluble vitamins. Structures and stability.
- Item 14. Pigments in foods. Structures and stability.
- Item 15. Aroma compounds. Concepts. Impact compounds. Aroma compounds generated in enzymatic and non-enzymatic reactions. Off-flavors. Food flavoring.
- Item 16. Food additives. Concept and classification. Additives descriptive.

2. Food of animal and plant origin: changes undergone during processing and/or storage.

- Item 17. Meat. Post-mortem changes. Effects of thermal treatment. Meat products.
- Item 18. Fish. Post-mortem changes. Changes during processing.
- Item 19. Milk. Effects of thermal treatment. Dairy products. Changes during their elaboration.
- Item 20. Cereals: Changes during storage of grain and flour. Changes during baking and storage of bread.
- Item 21. Fruits and vegetables. Changes during ripening, storage and processing.
- Item 22. Fermented beverages. Changes during their elaboration. Alterations.

3. Laboratory sessions

Lab sessions are conducted to: a) To identify or quantify the content of a component in food, b) assess its modification by food processing / or storage, c) observe the effect of certain properties of food components

These include:

- Modifications of myoglobin color in meat.
 - Assessment of water retention capacity in meat.
 - Evaluation of heating on soluble proteins in dairy products.
 - Evaluation of fermentation:
- a) Determination of lactose



- b) Determination of acidity
- Estimation of cooking oil quality:
- a) Colorimetric assay
- b) Measurement of capacitance
- Evaluation of flour strength. Pelshenke index. Effect of glutathione.
 - Determination of Brix degree in juices.
 - Evaluation of fruit maturity index.
 - Determination of hydroxymethylfurfural in honey.
 - Determination of tartrazine in a commercialized food colorant.
 - Detection of cyclamate in a diet soda.
 - Effect of gelatin on the polyphenols in wine.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	38,00	100
Laboratory practices	15,00	100
Seminars	2,00	100
Tutorials	2,00	100
Development of group work	20,00	0
Study and independent work	64,00	0
Readings supplementary material	2,00	0
Preparation of evaluation activities	4,00	0
TOTAL	147,00	

TEACHING METHODOLOGY

Lectures: explanatory meetings and / or demonstration of content, with a total of 38 hours/course. Classes are taught using audio-visual technical equipment. The student will previously have this material in the virtual platform.

Seminars: This is to construct knowledge through interaction and activity. Two coordinated seminars will be conducted on topics provided by the teacher following the guidelines on coordinated seminars available at the web page of the Faculty. The development of the seminar will be monitored through tutorials, to be agreed between the teacher and students. The seminars will be presented in writing and submitted by students. After the oral presentation speaking time will the other students, moderated by the teacher.

Practical lessons (laboratory): There will be 4 sessions of hands-on lab, three of four hours and one of three hours. Practices are conducted in pairs. At the end of the lab sessions, students must fill, in pairs, the report available in the virtual platform, and it must be delivered printed in less than one week.



Tutorials: Personal and/or in group attention. Two tutorials will be made, of one hour each for group of students. Students raised doubts about the subject, as well as the short questions and/or problems given previously in the virtual platform.

Individual or group work and study: Developing the capacity of individual and in group learning.

EVALUATION

Learning assessment of knowledge, skills and abilities will take the form of continuous assessment throughout the semester.

Measurable parameters considered are:

- Written test which will assess the degree of general knowledge of theoretical and practical concepts and procedures presented for each topic
- Implementation of individual memories and/or collective exercises related to activities performed in the classroom and laboratory, which will assess the acquisition of competencies (skills and attitudes)
- Attitude of the student (valued on the basis of individual and in group tutorials, practical lessons and seminars).

The assessment will be performed as follows:

1. Acquisition of theoretical/practical concepts and way of their expression through written tests (75%). The subject of examination will include the topics covered in lectures and lab sessions. In the case of the Double Degree (Pharmacy and HND) it will be possible to include questions related to topics covered in the seminars. There will be a written test by call (2 h length) with questions of open-ended and short answers, or of alternative response (true-false) with reasoning; in the case of including multiple choice questions, wrong answers will be penalized; this test will also include numerical resolution of practical cases and short answers from the laboratory sessions (fundamentals, purpose of used reagents, etc.). The correction in the expression of concepts (including spelling) and the terminology used will be taken into account for the mark. It is necessary to reach 5 (out of 10) in order to sum the rest of marks obtained and pass the course.

2. Report from the lab sessions (5%) and the attitude and student participation in their development (5%).

Attendance to the lab sessions is compulsory to pass the course.

Assessment criteria:

- Attitude and participation in the lab sessions development: Aspects like previous preparation of practical classes, active intervention in issues raised in the laboratory, the cooperative attitude of teamwork and the care and preservation of material will be considered positive.



- Application of acquired knowledge to resolve proposed questions and/or problems.
- In the reports it will be assessed: Presentation (wording and use of appropriate language), realization of calculations and interpretation of the data obtained.

3. Tutorials: the performance of the questions proposed by the teacher will be assessed. The contribution of tutorials to the final mark will be **5%**.

Attendance to tutorials is compulsory the first year in order to pass the subject.

4. Seminars: written work, presentation, defense and proposed activities (**10%**). In the assessment of seminars it will be taken into account the work in writing, presentation, defense and proposed activities, the level of understanding of the contents as well as the skills for its presentation and discussion, aspects agreed for coordinated seminars (which will be published in the virtual platform).

Attendance to seminars is compulsory the first year in order to pass the subject.

Notes:

- (i) **Attendance to laboratory sessions, seminars and tutorials is compulsory to pass the course.**
- (ii) **Students who in the first call did not pass the written test, the marks corresponding to seminars, tutorials and lab sessions will be maintained until the second call of the same year.**
- (iii) **Students who are repeating the subject, marks from the tutorials and seminars will be maintained. Marks corresponding to the laboratory sessions will be maintained for the following two years after their performing. After this period, lab sessions will have to be repeated.**
- (iv) **Although, numerically the sum of the marks corresponding to seminars, tutorials and lab sessions will achieve 50%, the subject will not be considered as passed if the mark corresponding to the written theoretical/practical test has not achieved the established minimum.**
- (v) **In the case of a student who passes tutorials, seminars and lab sessions, but not assisted to the written theoretical/practical test, the mark obtained will be “not presented” in the first call; in the second, the mark will be “not passed”.**

REFERENCES

Basic

- BADUI, S.: Química de los Alimentos. 4ª ed., Ed. Pearson. 2006. México.
- BELITZ H.D., GROSCH W.: Química de los Alimentos. 3ª y 2ª ed., Ed. Acribia S.A., Zaragoza, 2012 y 1997.
- CHEFTEL, J.C., CHEFTEL, H.: Introducción a la Bioquímica y Tecnología de los Alimentos. Ed. Acribia. Zaragoza, 2000.
- COULTATE, T.P.: Manual de Química y Bioquímica de los Alimentos. Ed. Acribia S.A. Zaragoza, 2007.
- FENNEMA, O.R.: Química de los Alimentos. 3ª ed., Ed. Acribia. Zaragoza, 2010.
- JEANTET, R. et al. Ciencia de los Alimentos. Vol 1 y 2. Ed. Acribia. Zaragoza. 2010.



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- LOPEZ DE LA TORRE, G., CARBALLO GARCIA, B.M.: Manual de Bioquímica y Tecnología de la Carne. Ed. Madrid Vicente. Madrid, 1991.
- MATISSEK, R., SCHNEPEL, F.M., STEINER, G. Análisis de Alimentos. Ed. Acribia. Zaragoza, 1998.
- ORDOÑEZ (ed.): Tecnología de los Alimentos. Vol. I. Componentes de los Alimentos y Procesos. Ed. Síntesis. Madrid, 1998.
- PRIMO YUFERA, E.: "Química de los Alimentos". Ed. Síntesis. Madrid, 1998.
- WEAVER, C.M., DANIEL, J.R. The Food Chemistry Laboratory, 2ª ed. CRC Press, Boca Raton (EE.UU.), 2003.
- WONG, D.W.S.: Química de los Alimentos. Mecanismos y Teoría. Ed. Acribia. Zaragoza, 1994.

Additional

- <http://milksci.unizar.es/bioquimica/uso.html>
<http://www.cyberlipid.org/>
<http://lipidlibrary.aocs.org/>
http://www.aecosan.msssi.gob.es/AECOSAN/web/home/aecosan_inicio.htm
<http://www.efsa.europa.eu/>
<http://www.eufic.org/index/es/>

Revistas: Alimentaria (a través de los BBDD de la UV)

Revistas: Alimentación, equipos y tecnología (disponible en la Biblioteca de la Facultad)

Revistas: Alimentación, nutrición y salud (Instituto Danone)

(http://www.institutodanone.es/phone/articulos_publicados.html)