

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

Code	33943
Name	Foodstuff Chemistry
Cycle	Grade
ECTS Credits	6.0
Academic year	2018 - 2019

Study (s)

Degree	Center	Acad. year	Period
1205 - Degree in Human Nutrition and Dietetics	Faculty of Pharmacy and Food Sciences	2	First term
1211 - D.D. in Pharmacy-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 - D.D. in Pharmacy-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 mandatory subject, carrying 6 ECTS in the second year, second semester of the Human Nutrition and Dietetics (HND) and of the Double Degree (Pharmacy and HND). It is part of Module 2: Food Science, which includes other subjects such as Bromatology, Fundamentals of Food Technology and Technology Cuisine.



To gain insight into the physicochemical changes that can occur in foods and act on them, producing the desired changes, the first thing we need is to know are the characteristics of their components. Food Chemistry studies the different substances that can become part of the food, their structure, characteristics, physicochemical 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 non-nutritional substances for the human organism, such as pigments, flavourings and food additives.

Foods derived from biological systems, i.e. from two main sources, animals and plants, undergo changes along time, in some cases due to their own cellular metabolism. In addition, the transformation undergone during processing and/or storage of foods requires a detailed study for each type of food, as these stages are influenced by their specific characteristics.

In short, the subject of Food Chemistry deals with the study of:

- a) Components of food: structure, physicochemical 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

Subjects of the Basic Module, essentially, 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).

OUTCOMES

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

- To master the terminology of the subject
- To understand the effects of technological processes on the chemical properties of food components.
- To apply the knowledge acquired in the handling and storage of food.
- To evaluate possible causes of sensory and/or nutritional changes of the components and/or food.
- To apply the knowledge to design and/or improve food
- To know, critically assess, manage and apply the most relevant basic and specialized bibliographic sources, as well as some on-line sources of dissemination of subjects related to food chemistry.
- To acquire the ability to synthesize and organize the information obtained from various sources properly.
- To be able to express adequately, both orally and in writing, the knowledge gained and put it in context with previously acquired knowledge.



- To know how to apply scientific rigor in laboratory assays and in problem-solving.
- To adopt the skill 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. Literature.
- 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 fibre. 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. Classification 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-flavours. Food flavouring.
- Item 16. Food additives. Concept and classification. Description of additives.

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 vegetable. Changes during ripening, storage and processing.
- Item 22. Fermented beverages. Changes during their elaboration. Alterations.



3. Laboratory sessions

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

These include:

- Modification of the myoglobin colour of meat.
- Assessment of water retention capacity in meat.
- Evaluation of the effect of heating on soluble proteins in dairy products.
- Evaluation of fermentation in dairy products:
 - a) Determination of lactose
 - b) Determination of acidity
- Assessment of frying oil quality:
 - a) Colorimetric assay
 - b) Measurement of capacitance
- Evaluation of flour strength. Pelshenke index. Effect of glutathione.
- Determination of Brix degrees in juices.
- Evaluation of fruit maturity index.
- Determination of hydroxymethylfurfural in honey.
- Determination of tartrazine in a commercialized food colouring.

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

Theoretical classes: explanatory sessions and/or demonstration of contents, with a total of 38 hours/term. Classes are taught using audio-visual technical equipment. The student will have this material available on the online platform beforehand.



Seminars: Students gain insight through interaction and activities. Two coordinated seminars will take place on topics provided by the teacher and related to the course, and must follow the guidelines on coordinated seminars available at the web page of the faculty. In the case of Double Degree (Pharmacy and HND) the two seminars will not be coordinated.

The development of the seminar will be monitored through tutorials, to be agreed upon between the teacher and the students. The seminars will be presented in writing and explained orally by the students. After the oral presentation, discussion will take place with the other students, chaired by the teacher.

Practical lessons (laboratory): There will be four hands-on lab sessions, i.e. three of four hours and one of three hours. Practice exercises will be done in pairs. At the end of the lab sessions, students must fill in, in pairs, the report available on the online platform, and it must be delivered through this platform, within a week.

Tutorials: Students can attend tutorials either individually or in a group. Two tutorials of one hour each will take place. Students' queries about the subject, as well as the short questions and/or problems given previously on the online platform, will be dealt with.

Individual or group work and study: individual and in-group learning capacity will be developed.

EVALUATION

The acquisition of knowledge, competence and skills will be assessed continuously throughout the term.

Measurable parameters considered are:

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

The assessment will take place as follows:

1. Acquisition of theoretical/practical concepts and their expression through written tests (75%).

The exam matters will include the topics covered in the theoretical and practical sessions. In the case of the Double Degree (Pharmacy and HND) it will be possible to include questions related to topics worked in the seminars. There will be a written test with two calls with prior notice (2 h length) including open questions with short answers, or true-false responses with justifications; in the possible case of multiple choice questions, wrong answers will be penalized; this test will also include numerical resolution of practical cases and short questions concerning the laboratory sessions (basics, purpose of used reagents, etc.). The correct expression of concepts (including spelling) as well as the correct use of the terminology will be taken into account for the mark. Students must reach 5 out of 10 to be added up with the rest of marks obtained and thus pass the subject.



2. Report on the lab sessions (5%) and the student's attitude and participation in the lab sessions (5%).

Attendance of the lab sessions is compulsory to pass the subject.

Assessment criteria:

- Attitude and participation during the lab sessions: Aspects like previous preparation of practical classes (to be assessed by means of a test during lab sessions), active intervention in issues raised in the laboratory, the cooperative attitude, teamwork and the care and management of material will be considered.
- Application of acquired knowledge to resolve proposed questions and/or problems.
- In the reports, the presentation (wording and use of appropriate language), solving of calculations and interpretation of the data obtained will be assessed.

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

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

4. Seminars: the following items will be taken into account for their assessment: written work, presentation, defence and proposed activities, level of understanding of the contents as well as the skills for its presentation and discussion, aspects agreed for coordinated seminars (which are available on the website of the faculty). The contribution of seminars to the final mark will be **10%**.

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

Notes:

(i) Attendance of laboratory sessions, seminars and tutorials is compulsory to pass the subject.

(ii) Students who in the first call do not pass the written test, will keep their marks corresponding to seminars, tutorials and report from lab sessions until the second call of the same year.

(iii) Students retaking the subject will keep their marks corresponding to seminars and tutorials. Marks corresponding to the laboratory sessions will be kept for the following two years after their completion. After this period, lab sessions will have to be retaken.



(iv) Although, numerically the sum of the marks corresponding to seminars, tutorials and lab sessions will make up 50%, the subject will not be considered as passed if the mark corresponding to the written theoretical/practical test does not reached the established minimum.

(v) In case a student passes tutorials, seminars and lab sessions, but does not attend the written theoretical/practical test, the mark obtained will be “absent” in the first call; in the second, the mark will be “fail”.

REFERENCES

Basic

- BADUI, S.: Química de los Alimentos. 5ª ed., Ed. Pearson. 2013. México. (disponible también e-book).
- BELITZ H.D., GROSCH W.: Química de los Alimentos. 3ª ed., Ed. Acribia S.A., Zaragoza, 2012.
- 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.
- LINDEN, G., LORIENT, D.: Bioquímica Agroindustrial. 2ª ed. Ed. Acribia. Zaragoza, 1996
- 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)

