COURSE DATA

DATA SUBJECT

Code: 33951
Name: Food Toxicology
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1205 - Degree in Human Nutrition and Dietetics	Facultat de Farmácia i Ciències de L'alimentació	3	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1205 - Degree in Human Nutrition and Dietetics	Food toxicology	COMPULSORY

COORDINATION

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SUMMARY

The subject of food toxicology (33951) is a subject of mandatory third-degree course of Human Nutrition and Dietetics, which is taught in the Faculty of Pharmacy, University of Valencia. This course provides the current curriculum for a total of 6 ECTS credits are given twice a year.

The main objective of the subject of Food Toxicology is the toxicological formation with the purpose of guaranteeing to the population safe foods. For this, knowledge will be provided on several blocks: General toxicology including the phases of the toxic phenomenon, the evaluation of toxicity and risk. Food intoxications, that is, pathologies caused by natural toxins, biological contaminants, chemical pollutants as inorganic and organic, natural or synthetic and toxic derivatives. Computer and laboratory practices will be carried out where analytical methods will be applied to determine toxic concentrations in food and interpret the results obtained.

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 toxicology, knowledge of a number of basic concepts of biology, physiology, chemistry and biochemistry are needed. These concepts are part of the contents of the subjects taught during the previous courses in the Graduate.

COMPETENCES / LEARNING OUTCOMES

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Acquire basic training for the research activity, be able to formulate hypotheses, collect and interpret information for problem solving using the scientific method, and understand the importance and the limitations of scientific thought in the field of health and nutrition.

Collaborate in the prevention of food poisoning and know the safety limits of toxins to ensure safe food to the population.

Communicate effectively, both orally and in writing, with people, with health or industry professionals and with the media, knowing how to use information and communication technologies, especially those related to nutrition and lifestyles.

Conocer y manejar las fuentes de información básicas relacionadas con la Toxicología alimentaria.

Know, judge and know how to use and apply the sources of information related to nutrition, food, lifestyles and health.

Know about the harmful effects of toxic substances in food, mechanism and signs of these effects.

Know about the microbiology, parasitology and toxicology of food.

Know about the various toxicokinetic processes (absorption, distribution, metabolism and excretion).

Know aspects related to the assessment and characterisation of the toxicological risk of potentially toxic substances in food.

Know the basics of occupational toxicology.

Know the general mechanisms of toxic action.

Know the methods most commonly used for the analysis of toxic substances in food.

Know the procedures for the evaluation of toxicity.

Know the sources of exposure, pathophysiology, toxic effects and mechanism of action of toxic substances present in foodstuffs.

Practise the profession with respect for other health professionals and acquire skills to work in teams.

Recognise 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.

DESCRIPTION OF CONTENTS

1. General Toxicology: Toxicity and concepts

Unit 1. Food Toxicology: Introduction. Historical evolution. Bibliography.
Unit 2. Toxicological concepts. Intoxication classification. Classification of toxic substances.
Unit 3. Dose-effect relationships and dose response. Uncertainty factors

2. Phases of toxic action. Toxicokinetics

Toxicokinetics
Unit 4. Phases of toxic action. Exposure phase. Pathways for xenobiotics. Passing mechanisms of the toxins through biological membranes. Absorption.
Unit 5. Distribution, fixation and excretion of toxins.
Unit 6. Biotransformations of toxins. Phase 1 reaction: oxidation, reduction, hydrolysis and hydration.
Unit 7. Reactions Phase 2: Sulfation, glucuronidation, acetylation, methylation, conjugation with glutathione and amino acids.
Mechanisms of toxicity. Factors that modify toxicity
Unit 8. Mechanisms of toxicity. Apoptosis and necrosis.
Unit 9. Mechanisms of toxicity. Nonspecific and specific toxicity. Reversible and irreversible toxicity reactions.
Unit 10. Immune reactions. Food Allergies
Unit 11. Factors that modify toxicity. Factors that depend on the individual: genetic factors. Environmental factors.

3. Evaluation of the toxicity.

Unit 12. Procedures for toxicological evaluation. General effect studies: Acute, subchronic and chronic toxicity tests.
Unit 13. Studies of specific effects: carcinogenesis, mutagenesis, teratogenesis and effects on reproduction, skin, eyes and behavior.
Unit 14. Alternative methods. In Vitro assays. Biological substrates. Indicators of toxicity.

4. Food Toxicology

Natural toxics
Unit 15. Marine food: Intoxications by molluscs and fish.
Unit 16. Toxics in vegetable products. Anti-nutritive substances. Superior mushrooms.

Biological contaminants
Unit 17. Toxic effects of biological contaminants. Food intoxications. Botulism, Bacillus cereus and Staphylococcus aureus.
Unit 18. Food toxin infections: salmonellosis, listeriosis, toxin infection by Escherichia coli, Clostridium perfringens toxicity and campylobacteriosis.

Chemical contaminants
Unit 19. Inorganic chemical contaminants. Metals (I): Lead and mercury.
Unit 20. Metals (II): arsenic, cadmium and aluminum.
Unit 21. Toxic effects of fluorides, nitrates and nitrites.
Unit 22. Mycotoxins. Most frequent foods involved as sources of exposure. Factors that favor pollution. Prevention and legislation.
Unit 23. Organic chemical contaminants. Pesticides: classification and toxicity. Organochlorine pesticides and related structures (dioxins, furans and polychlorinated biphenyls).
Unit 24. Organophosphorus pesticides, carbamates and bipyridyl salts. Mechanisms of action and toxic effects. Presence in foods. Preventive measures.
Unit 25. Residues of veterinary drugs. Classification. Mechanisms of action and main toxic effects. Toxic risk assessment.
Unit 26. Food additives. Definition and classification. Risk assessment
Unit 27. Food supplements. Vitamins, Minerals, Other supplements. Adverse effects.

Toxic derivatives
Unit 28. Toxics formed during the processing, preparation and storage of food. Pyrogenic compounds. Non-pyrolytic compounds. Compounds formed by alkaline treatments.
Unit 29. Toxics derived from the heating and oxidation of fats and oils. Toxics formed by degradation or reaction of contaminants.

Food carcinogens
Unit 30. Food carcinogens. Diet-cancer.

Toxicological risks evaluation
Unit 31. Risk analysis. Risks evaluation. Characterization of risks. Risk management.

5. Food Toxicology practices

Good Laboratory Practice. Standard analytical food toxicology analysis. Analysis of toxic xenobiotics and as a means of quality control. Types of analysis. Toxicological analysis techniques. Evaluation of analytical data. Toxicology report

1. Safety in handling chemicals.
2 .- Management of Databases in Toxicology
3 .- Determination of nitrate in vegetables by visible spectrometry

4 .- Determination of herbicides in water by liquid chromatography
5 .- Determination of pesticides by solid phase extraction and gas chromatography.
6 .- Determination of nitrite in meat by visible spectrometry.
7 .- Determination of fluoride in water by potentiometer

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Tutorials	2,00
Theory	38,00
Seminar	2,00
Laboratory	15,00
Total hours	**57,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	9,00
Independent study and work	0,00
Preparation of lessons	81,00
Preparation for assessment activities	0,00
Resolution of case studies	0,00
Total hours	**90,00**

TEACHING METHODOLOGY

The development of the course will be structured as follows:

Theoretical classes the professor offers the student a global vision of the subject, as well as the necessary information to understand the contents of the subject. In these classes, the student is encouraged to search for additional or complementary information, guiding him/her in the use of the appropriate bibliographic sources. In order to follow the class, the student is recommended to review in advance the material that the professor leaves in the virtual classroom.

Tutoring sessions will be organized in small groups of students with the purpose of orienting the students and determining the functioning of the course. It will be the ideal way for students to raise any doubts or questions that may arise during the development of the classes.

Practical laboratory sessions. They will be carried out in small groups and attendance is mandatory. The student's work is directed step by step, so that he/she acquires manual skills in the laboratory and solves by him/herself the problems that are posed. On the last day of practice, the students present the results

obtained to the rest of the group and the toxicological interpretation of the results is discussed. At the end, they must hand in a notebook-memory of the same. This block includes a computer practice, in which the student is oriented to search for toxicological information on the Internet and access to useful databases in Toxicology.

Seminars/workshops. A group work will be carried out on a topic proposed by the professor in order to expose it to the rest of the class and to generate a later debate. A written script will be given to the classmates before the exposition. The group is personally supervised by the teacher periodically and guides them in the search for bibliographic sources and in the critical analysis of the data found in these sources. The professor advises on the general approach of the work, so as to encourage the student's capacity for work, synthesis and research.

In both theoretical and practical sessions, we will work with the **Sustainable Development Goals (SDGs)** using examples related to the content of the subject; in addition, related topics will be proposed for the coordinated seminars. This is intended to know and approach the points and challenges that are addressed in different SDGs in the subject of food toxicology and that will allow students of the Degree of Human Nutrition and Dietetics to have a critical view, and make a reflection of aspects that in their professional future will be necessary. Of the 17 Sustainable Development Goals, the following SDGs related to food toxicology will be addressed: SDG2, SDG3, SDG4, SDG5, SDG6, SDG12, SDG13.

EVALUATION

The completion of practice, seminars and tutorials is mandatory to pass the course.

A minimum grade of **4/10** in the theory and **4/10** in the practical is required to compensate between them. The grade of the seminars and tutorials will be added if, and only if, the sum of the grades of the practical exam and theoretical exams is equal or higher than 5/10.

Students who obtained a grade lower than 4 in the problems part, but have passed the theory (grade equal or higher than 5/10) may retake only the problems section in the second examination call.

If any of these minimum requirements are not met, the grade will be fail and the final mark will correspond to the sum of the theory and practical exam grades, excluding the rest of the sections (tutorials and seminar).

The course is passed when the specific competences of the subject are acquired (minimum overall grade 5/10).

The **theoretical contents** will account for **67%** of the overall grade of the course. Assessment will be carried out by means of an exam in the official examination calls. An eliminatory test of the experimental toxicology topics will also be scheduled, which will account for **7%** of the grade. Students who achieve a grade higher or equal to 5/10, will not have to take these subjects in the final exam.

Laboratory practical classes will represent 20% of the final grade. Assessment will be carried out through

attendance, delivery of the practical report and a written exam that will take place at the same time as the exam of the theoretical contents. In order to take the final written exam, it is mandatory to have completed the practice and handed in the practice report, which will be graded with PASS or FAIL.

Practice, tutorials and seminars are **MANDATORY AND NOT RECOVERABLE** activities, in accordance with the provisions of Article 6.5 of the UV Evaluation and Grading Regulations for Undergraduate and Master's Degrees. In the event that, for **justified reasons**, the student cannot attend, he/she must communicate with sufficient time in advance, so that the person in charge of the subject can assign the student a session in another group. In no case, the course can be passed without taking and passing the laboratory practice.

The evaluation of the **tutorials** will represent **3%** of the final grade. This grade will take into account the resolution of the proposed tasks, other than the laboratory practice and seminars. The non-attendance to tutorials (without justified cause), will imply a zero in the evaluation section corresponding to tutorials.

The preparation and presentation of **seminars** will represent **10%** of the final grade. The content, structure and expression of the written work will be evaluated, as well as the capacity of synthesis and clarity in the oral presentation. Attendance to the seminars is compulsory.

In the case of failing the course in the second call, the laboratory practice does not have to be repeated during the following two courses. However, attendance and completion of the tasks proposed in the tutorial sessions will have to be repeated.

Those students who do not pass the course in the first call, the grade corresponding to seminars will be kept for the July call.

In addition, for the evaluation of the learning process, the professor will directly evaluate the student's attitude and participation in both theoretical and practical classes.

Copying or plagiarism of any assignment that is part of the evaluation will make it impossible to pass the course, and the student will be subject to the appropriate disciplinary procedures. Please note that, according to Article 13. d) of the University Student Statute (RD 1791/2010, December 30), it is the duty of a student to refrain from using or cooperating in fraudulent procedures in the evaluation tests or in the work performed.

In the event of fraudulent practices, the Action Protocol for fraudulent practices at the University of Valencia will be applied (ACGUV 123/2020):

https://www.uv.es/sgeneral/Protocols/C83sp.pdf

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