VNIVERSITAT DE VALÈNCIA

Course Guide
34008 Food Toxicology

COURSE DATA

DATA SUBJECT

Code: 34008
Name: Food Toxicology
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2026-27

STUDY (S)

Degree	Center	Acad. year	Period
1103 - Degree in Food Science and Technology	Facultat de Farmàcia i Ciències de l'alimentació	3	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1103 - Degree in Food Science and Technology	Food toxicology	COMPULSORY

COORDINATION

BERRADA RAMDANI HOUDA

SUMMARY

The subject of food toxicology (34008) is a subject of mandatory third-degree course of Food Science and Technology which is taught in the Faculty of Pharmacy and Food Sciences at Valencia University. This course provides the current curriculum for a total of 6 ECTS credits.

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 degree in Food Science and Technology.

COMPETENCES / LEARNING OUTCOMES

1103 - Degree in Food Science and Technology

Analyze and evaluate food safety risks.

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

Conocimiento adecuado de los mecanismos generales de la acción tóxica.

Know about the changes in toxic substances taking place during the technological processing of foodstuffs.

Know about toxicological risk assessment procedures.

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

Know the sources of exposure, pathophysiology, symptoms, diagnosis and treatment of poisoning by natural and artificial toxic substances present in food.

Manage food safety.

Prevent food poisoning by establishing toxicity safety limits in order to ensure safe food to the population.

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. Toxicokinetic. Mechanisms

Unit 4. Phases of toxic action. Exposure phase. Entrances of the toxics. Mechanisms of passage of toxics through biological membranes. Absorption.
Unit 5. Distribution, fixation and excretion of toxics. Clearance and half-life.

Unit 6. Biotransformations of toxics. Phase 1 reactions: oxidation, reduction, hydrolysis and hydration.
Unit 7. Phase 2 reactions: sulfatation, glucuronation, methylation, acetylation and conjugation with glutathione and amino acids.
Unit 8. Mechanisms of toxicity. Apoptosis and necrosis
Unit 9. Mechanisms of Non-specific toxicity and specific toxicity. Reversible and irreversible reactions.
Unit 10. Immunological mechanisms. Food allergies.
Unit 11. Factors that modify the toxicity. Factors that depend on the individual: genetic factors. Environmental factors.

3. Evaluation of the toxicity.

Procedures for toxicological evaluation. Tests of general and specific toxicity.
Chapter 12. Procedures for toxicological evaluation. Acute toxicity tests and chronic.
Chapter 13. Carcinogenic, mutagenic, teratogenic and reproductive toxic effects.
Chapter 14. Alternative methods. Vitro assays. Biological substrates. Indicators of toxicity.

4. Food Toxicology

Unit 15. Marine food: Intoxications by molluscs and fish.
Unit 16. Toxics in vegetable products. Anti-nutritive substances. Superior mushrooms.
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.
Unit 19. Inorganic chemical contaminants. Metals (I): Lead and mercury. Causes of food contamination by metals. Sources of exposure: lead and mercury. Mechanisms of action and toxic effects. Speciation.
Unit 20. Metals (II): arsenic, cadmium and aluminum. Mechanisms of action and main toxic effects. Speciation Food implicated as a source of exposure.
Unit 21. Toxic effects of fluorides, nitrates and nitrites.
Unit 22. Mycotoxins. Most frequent foods involved as sources of exposure.
Unit 23. Organic chemical contaminants. Pesticides: classification and toxicity.
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.
Unit 26. Food additives. Definition and classification.
Unit 27. Food supplements. Vitamins Minerals Other supplements. Adverse effects.
Unit 28. Toxics formed during the processing, preparation and storage of food. Pyrogenic compounds.
Unit 29. Toxic substances derived from the heating and oxidation of fats and oils. Toxic formed by degradation or reaction of pollutants.
Unit 30. Food carcinogens. Diet-cancer
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 is structured as follows:

Theoretical classes the teacher provides the student an overview of the topic, and the information necessary to understand the contents of the subject. In these classes the students themselves are encouraged to conduct the search for accessory or additional information, guiding the use of bibliographical sources needed. To monitor the class the student is recommended to review the material before the teacher leaves the virtual classroom.

Specialized tutoring sessions in groups. Be organized in small groups of students in order to guide students and determine the functioning of the course. It will be the ideal means for students to raise questions or issues they arise throughout the development agenda.

Hands-on labs. Be conducted in small groups and attendance is mandatory. He goes step by step the student's work, to make acquire dexterity in the laboratory and determine for himself the problems that are raised. The last day of training students exposed to the group results and discuss the toxicological interpretation of them. Upon completion, must submit a notebook memory of them.

Within this block includes a practical computer, which guides the student on toxicological information search on the Internet and access to databases useful in Toxicology.

Seminars. There will be a group work on an issue raised by the teacher in order to expose to the rest of the class and generate further debate. Be given in writing prior to the show a script to peers. The group is personally supervised by the teacher on a regular basis and directs the search of bibliographic sources and critical analysis of the data found in these sources. The teacher advised about the general approach of the work, so to build capacity for work, synthesis and research student

During the activities, both theoretical and practical,examples of the applications of the contents of the subject in relation to theSustainable Development Goals (SDG), as well as in the proposals of topics for thecoordinated seminars. This is intended to provide students with knowledge,skills and motivation to understand and address these SDGs, while promoting thereflection and criticism

During the activities, both theoretical and practical, examples of the applications of the contents of the subject in relation to the Sustainable Development Goals (SDG) will be indicated, as well as in the proposals of topics for the coordinated seminars. This is intended to provide students with knowledge, skills and motivation to understand and address these SDGs, while promoting reflection and criticism. Of the 17 Sustainable Development Goals, particular emphasis will be placed on the following goals related to food security:

1- Goal 1: End poverty in all its forms everywhere

2- Objective 2: Zero Hunger

3- Objective 3: Guarantee a healthy life and promote well-being for all at all ages.

4- Objective 13: Take urgent measures to combat climate change and its impacts

EVALUATION

To assess the theoretical content, an exam will be held to evaluate the theoretical topics of the course. The theoretical content will account for 67% of the overall course grade. The evaluation will be carried out through exams during the official exam sessions. A midterm exam covering the topics of experimental toxicology will be scheduled, which will account for 7% of the final grade.

Laboratory practical sessions will be assessed through attendance and a written exam, which will take place during the same session as the theoretical exam. At the end of the practicals, students must submit a practical report, which will be graded as either "pass" or "fail". The practical component will account for 20%

of the final grade.

The preparation and presentation of seminars will represent 10% of the final grade. Both the content, structure, and writing of the written work and the ability to synthesize and clearly present the oral presentation will be evaluated.

Participation in practicals, seminars, and tutorials is mandatory to pass the course. The tutorial component will represent 3% of the final grade.

A minimum score of 4/10 in both theory and practicals is required to compensate with the rest of the grades. The grades from seminars and tutorials will only be added if, and only if, the combined score of the theory and practical exams is equal to or greater than 5/10. If any of these minimum requirements are not met, the final grade will be ¿Fail¿ and will consist only of the sum of the theory and practical exams, without including seminars and tutorials.

For students who do not pass the course in the first exam session, their seminar and tutorial grades will be carried over to the July session.

Practicals, seminars, and tutorials are MANDATORY AND NON-RECOVERABLE activities, in accordance with Article 6.5 of the University of Valencia's Evaluation and Grading Regulations for Bachelor's and Master's Degrees. If, for a justified reason, a student cannot attend, this must be communicated in advance so that the course coordinator can assign the student to another group. Under no circumstances can the course be passed without completing and passing the laboratory practicals.

Any clear instance of copying or plagiarism in any evaluation task will result in failure of the course and may lead to disciplinary action. According to Article 13.d) of the Student Statute (Royal Decree 1791/2010, of December 30), students are obliged to refrain from using or cooperating in fraudulent procedures in exams, assignments, or official university documents. In cases of fraud, action will be taken in accordance with the "Protocol for Action against Fraudulent Practices at the University of Valencia" (ACGUV 123/2020): https://www.uv.es/sgeneral/Protocols/C83.pdf

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Basic Bibliography:

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- Cameán A, RepettoM. Toxicología Alimentaria. Díaz de Santos, Madrid. 2012.
- Klaassen, C.D. Casarett and Doull's. Toxicology: The basic science of poisons. (9th ed.) eds. McGraw Hill Education. 2019.
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- Repetto M, Repetto G. (2024). Toxicología Fundamental. 5.ª ed, Díaz de Santos, Madrid.
- López de Cerain, A; Azqueta, A; Gil, G; Vettorazzi, A. (2020). Toxicología. Colección "Apuntes" EUNSA, Pamplona.

Specialized bibliography:

- Hayes AW, Kruger C L. Hayes' Principles and Methods of Toxicology. (6th ed.) CRC Press. London. 2014.
- Lawrence, F. (2023). Food safety and Toxicology. New York. Syrawood Publishing House.
- Revista del Comité Científico de la Agencia Española de Seguridad Alimentaria y Nutrición (AECOSAN)
- Revista de la Sociedad Española de Toxicología (AETOX)
- Guía FAO/OMS para la aplicación de principios y procedimientos de análisis de riesgos en situaciones de emergencia relativas a la inocuidad de los alimentos

Websites of interest:

- http://www.aecosan.msssi.gob.es/AECOSAN/web/
- http://www.efsa.europa.eu/es/glossary/risk-assessment
- https://www.elika.eus/
- https://www.eufic.org/es/
- http://acsa.gencat.cat/es/seguretat_alimentaria/avaluacio_de_riscos/
- http://www.aetox.es