COURSE DATA

DATA SUBJECT

Code: 36312
Name: Toxicology
Cycle: Undergraduate Studies
ECTS Credits: 10.5
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1211 - Double Degree in Pharmacy and Human Nutrition and Dietetics	Facultat de Farmàcia i Ciències de L'alimentació	4	Annual

SUBJECT-MATTER

Degree	Subject-matter	Character
1211 - Double Degree in Pharmacy and Human Nutrition and Dietetics	Asignaturas obligatorias del PDG Farmacia-Nutrición Humana y Dietética	COMPULSORY

COORDINATION

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SUMMARY

Toxicology course (36312) is an obligatory subject on the third year of the Degree of the double degree program Pharmacy-Human Nutrition and Dietetics Pharmacy, which is taught in the Faculty of Pharmacy, University of Valencia. This course has a total of 10,5 ECTS taught during a year. The main objective of this subject is to obtain a toxicological training that allows to interpret scientific data relative to drugs and the presence of toxins in food. Thanks to this interpretation the pharmacist and nutritionist-dietitian can take the most appropriate measures for each situation. The knowledge will be provided to the students on basic toxicology, mechanisms of toxicity, evaluation of toxicity, and the toxicity of drugs as potential agents with adverse effects when used in a correct therapeutic guideline or as responsible for acute intoxication, toxicity and food safety. As well as the knowledge on the methodologies that allow to decrease toxic concentrations in biological samples, environmental foods and samples, to assure levels that provide a well-being to the population.

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, the 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

DESCRIPTION OF CONTENTS

1. Introduction to toxicology

Toxicology. Introduction. Historic evolution of toxicology. Related sciences. Related disciplines of toxicology. References. Toxicological concepts. Types of intoxications. Dose-response and dose-effect relationships. Selectivity, sensibility and security margin.

2. Toxicokinetics

Phases of toxic action. Exposure phase. Pathways for xenobiotics. Transport mechanisms of toxins through biological membranes. Absorption. Distribution, fixation and excretion of toxins. Toxicokinetics. Biotransformations of toxins. Phase 1 reaction: oxidation, reduction, hydrolysis and hydration. Reactions Phase 2: Sulfation, glucuronidation, acetylation, methylation, conjugation with glutathione and amino acids. Mechanisms of toxicity. Apoptosis and necrosis. Nonspecific toxicity. Reversible and irreversible specific toxicity. Immune reactions. Immune mechanisms. Types of allergies. Inhibition, activation and enzyme induction. Factors that modify toxicity. Factors that depend on the individual. Genetic factors. Environmental factors and social factors.

3. Assessment of Toxicology

Methods in toxicology testing. Alternative methods. In vitro test systems. Biological substrates and toxicity endpoints. Studies of general effects: acute toxicity and repeated doses toxicity. Tests of specific effects: Antagonism or synergism studies, and skin, eyes and behavior tests. Carcinogenicity, mutagenicity, teratogenicity, Reproductive and Developmental Toxicity. Risk assessment and security estimation.

4. Methodology for detecting negative medication outcomes: Pharmacotherapeutic monitoring methodology

Adverse drug reactions. Criteria to determine an adverse reaction. Studies of pharmacovigilance. Methodology in pharmacotherapy follow-up. Introduction to the Dáder method. Classification of negative outcomes of the pharmacotherapy /drug treatment. Clinical case.

5. Side effects of medicinal products and medical devices on organs and systems

Adverse drug reaction on the central and peripheral nervous system. Adverse drug reaction on arteries and pulmonary capillaries. Pulmonary veno-occlusive disorders. Bronchial tube and lower tract.
Adverse drug reaction on the cardiovascular system. Hypertension, peripheral vasoconstriction and low blood pressure. Adverse drug reaction on the digestive system. Adverse drug reaction and mechanisms of toxic action on the liver. Adverse drug reaction and mechanisms of toxic action on the kidney. Adverse drug reaction on blood and hematopoietic organs. Anaemia, Neutropenia, agranulocytosis and thrombocytopenia. Secondary haematological tumours. Disorders of Haemostasis. Drug adverse reaction of the medicaments on the skin. Cutaneous elementary injuries. Adverse drug reaction on the endocrine system. Adverse reactions on the hypophysis, adrenal glands, thyroid and pancreas. Adverse drug reaction on the locomotor system. Adverse drug reaction on the sense organs: toxic effects on the organs of the vision, organ of hearing and balance, on taste and smell organ.

6. Clinical toxicology

Epidemiology of acute intoxications. Antagonists and Antidotes. Assistance and treatment of acute intoxication. Acute drug intoxication. Acute intoxication of domestic use products: Caustics and Pesticides. Drug addiction.

7. Food safety

Origin and sources of toxics in food, mechanisms of action, toxic effects and preventive measures. Food and toxic substances of natural origin. Biological and chemical contaminants. Food additives and supplements. Toxic derivatives. Food carcinogens. Risks assessment of food.

8. Analytical toxicology

Chemical - toxicological analysis. Sample collection and different toxicological analyses. Chain of custody. Immunochemical tests.

9. Laboratory

There will be 4 hours / session. Practices are of obligatory assistance. Practice manual will be made available to students through the Moodle platform and the students will take it to the laboratory. Students will have to overcome a written exam on the last day of practice.
The scheduled practices are as follows:
1. Pharmaceutical toxicology and databases
1.1. Safe handling of chemical products
1.2. Toxicological databases in Internet
2. Extraction of drugs from biological fluids
2.1. Identification of toxics
2.2. Determination of salicylates
3. Determination of alcohol in bloody by gas chromatography (GC)
4. Determination of trazodone in plasm by colorimetry
5. Phenothiazines determination in urine by spectrophotometry
6. Determination of theophylline in serum by liquid chromatography (LC)
7. Determination of paracetamol in plasma by LC
8. Determination of atmospheric SO2. Tetrachloromercurate method (TCM) and p-rosaniline
9. Determination of fluoride in urine

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Tutorials	3,00
Theory	68,00
Seminar	6,00
Laboratory	28,00
Total hours	**105,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	25,00
Independent study and work	25,00
Preparation of lessons	77,50
Preparation for assessment activities	20,00
Resolution of case studies	10,00
Total hours	**157,50**

TEACHING METHODOLOGY

The development of the course is structured as follows:

Theoretical classes: 2-3 hours per weeks in which the professor provides students with an overview of the topic, and the information necessary to understand the contents of the subject. The students are encouraged to search supplementary information. It is recommended to review the material before going to the classroom.

Specialized tutoring (sessions in group). Small groups of students are ideal for students to raise questions or issues that they arise throughout the development of the theoretical classes.

Laboratory classes: small groups of students work with the laboratory manual and resolve the problems that are raised. Class attendance is mandatory. Each student group shows their results and discusses their toxicological interpretation. Laboratory classes include toxicological information from internet and databases in Toxicology.

Seminars: a small working group is directed by a professor. The group works according to a basic guides and rules. The results are exposed and critical analysis should be made in class with all the students. The group is supervised by the professor periodically and guides them in the search of bibliographic sources and in their critical analysis. The professor advises about the general approach to work, in a way that promotes the student's capacity for work, synthesis and research

In both theoretical and practical sessions, examples of the applications of the contents of the course in relation to the Sustainable Development Goals (SDGs) will be indicated, as well as in the proposals of topics for the expository seminars. This is intended to integrate the application of the SDGs in the teaching of toxicology in order to provide students with the related knowledge and skills, as well as to promote reflection and critique. Of the 17 SDGs, special emphasis will be placed on the following toxicology-related goals: SDG3, SDG4, SDG5, SDG12, SDG13 and SDG17.

EVALUATION

Attendance at laboratory sessions is mandatory in order to pass the course.

Evaluation breakdown: 65% theory grade (20% from the first partial exam, 30% from the second partial exam, and 15% from the Food Toxicology section), 10% seminar grade, 25% practice grade.

10% of the grade of the course will be based on preparation for and participation in activities proposed during seminars and tutorials. The marks of this section will be kept for 2 consecutive academic years. Lack of regular attendance to class or tutorials will be negatively affect on the grade corresponding to this section.

25% of the grade will correspond to the **laboratory practices** that are of compulsory attendance, which will be evaluated on the last day through a practical activity **worth 5% of the final grade**, this score will be valid for two consecutive academic years (for students who do not pass the course on their first attempt). The other **20%** is equivalent to the practical questions carried out in the laboratory and practical cases that will

be evaluated in the final written exam.

The contents related to **Food Safety** constitute **15% of the final grade**. The evaluation is done by means of an exam that will be carried out together with the partial exam. To pass the part of Food Toxicology and to keep the grade in the first call, it is necessary to obtain a minimum score of 5 out of 10. To pass the subject of Food Toxicology in the final exam, the grade of Food Safety will have to have a score equal to or higher than 4.

There will be a theory exam at the end of the first semester corresponding to the first part of the syllabus, in which material can be eliminated from 5 out of 10 points and which constitutes 20% of the final grade. The grade of the partial exam will be kept for the exam of the first examination session and examination session. Students who have eliminated material in the first partial exam will only be evaluated in the final exam of the second part of the syllabus; those who have not passed the partial exam will take the final exam with the theoretical contents of the whole syllabus.

The other **30% of the grade** will be obtained from the results obtained in the exams corresponding to the **theoretical contents of the subject of the second semester.** It is an essential requirement to have passed the theoretical exam and to have completed the practical classes in order to add up the score for the seminars/tutorials section.

In order to pass the course, a grade of 5 or higher must be obtained.

Those students who do not pass the course in the first call will keep the grade corresponding to:

- First partial exam grade (if the grade is higher than 5).

- Food Safety grade (if the grade is higher than 5).

- Seminars for the second call (same academic year).

The student who does not take the theoretical exam and has taken seminars or practices during the academic year, in the first examination session will be considered "Absent" and in the second examination session as "Failed".

The student who does not take the theoretical exam and has taken seminars or practices during the academic year, in the first and second call will be considered as "Not presented".

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, in the work performed or in official university documents.

In the case of fraudulent practices, the procedure will be as determined by the **"Protocol of action against**

fraudulent practices at the University of Valencia" (ACGUV 123/2020): https://www.uv.es/sgeneral/Protocols/C83sp.pdf

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- European Medicines Agency, www.ema.europa.eu/
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