COURSE DATA

DATA SUBJECT

Code: 34083
Name: Toxicology
Cycle: Undergraduate Studies
ECTS Credits: 9
Academic year: 2026-27

STUDY (S)

Degree	Center	Acad. year	Period
1201 - Degree in Pharmacy	Facultat de Farmàcia i Ciències de l'alimentació	4	Annual

SUBJECT-MATTER

Degree	Subject-matter	Character
1201 - Degree in Pharmacy	Toxicology	COMPULSORY

COORDINATION

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SUMMARY

Toxicology course (34083) is an obligatory subject on the third year of the Degree of Pharmacy, which is taught in the Faculty of Pharmacy, University of Valencia. This course has a total of 9 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.

The knowledge will be provided to the students on basic toxicology, mechanisms of toxicity, evaluation of the toxicity, toxicity of drugs and sanitary products as potential agents with adverse effects when used in a correct therapeutic guideline or as responsible for acute intoxication. 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

1201 - Degree in Pharmacy

Act with autonomy in learning, making informed decisions in different contexts, issuing judgements based on experimentation and analysis, and transferring knowledge to new situations.

Apply the scientific method and acquire skills in handling legislation, information sources, bibliography, drafting of protocols and other aspects considered necessary for the design and critical evaluation of preclinical and clinical trials.

Assess the therapeutic and toxic effects of pharmacologically active substances.

Assess the toxic effects of pharmacologically active substances: adverse drug reactions. Acute and chronic intoxications.

Carry out activities of clinical and social pharmacy, following the pharmaceutical care cycle in relation to the safety of medicines and health products.

Collaborate effectively in work teams, assuming responsibilities and leadership roles and contributing to collective improvement and development.

Contribute to the design, development and implementation of solutions that respond to social demands, taking into account the Sustainable Development Goals as a reference.

Demonstrate critical and self-critical thinking in the field of the degree programme, considering aspects such as professional ethics, moral values and the social implications of the different activities carried out.

Design and evaluate toxicological tests.

Develop communication and information skills, both oral and written, to deal with patients and other health professionals in the centre where professional activity is carried out. Promote teamwork and collaboration skills in multidisciplinary teams and wi

Develop skills to update knowledge and undertake further studies, including pharmaceutical specialisation, scientific research, technological development and teaching.

Have basic knowledge of clinical management, health economics and efficient use of health resources.

Know analytical techniques related to laboratory diagnosis in poisonings caused by medicines.

Know and manage basic information sources related to toxicology.

Know and understand, within the field of the degree programme, gender inequalities in society; integrate

different needs and preferences based on sex and gender into the design of solutions and problem solving.

Know how to communicate effectively, both orally and in writing, adapting to the characteristics of the situation and the audience.

Know how to interpret, evaluate and communicate relevant data in the different areas of pharmaceutical activity, using information and communication technologies.

Know the basic concepts of toxicology.

Know the different toxicokinetic (absorption, distribution, metabolism and excretion) and ecotoxicokinetic processes.

Know the nature, mechanisms of action and effects of toxins and resources in case of intoxication.

Module: Biology. Estimate biological risks associated with the use of substances and laboratory processes involved.

Module: Chemistry. Estimate the risks associated with the use of chemical substances and laboratory processes.

Module: Medicine and Pharmacology. Carry out activities of clinical and social pharmacy, following the pharmaceutical care cycle.

Module: Medicine and Pharmacology. Evaluate the toxicological effects of substances and design and apply the corresponding tests and analyses.

Module: Medicine and Pharmacology. Know the analytical techniques related to laboratory diagnosis, toxins, food and environment.

Module: Medicine and Pharmacology. Know the nature, mechanism of action and effect of toxins, as well as resources in cases of poisoning.

Module: Medicine and Pharmacology. Promote the rational use of medicines and health products.

Possess and understand knowledge in the different areas of study included in pharmacist training.

Promote the rational use of medicines and health products.

Propose creative and innovative solutions to complex situations or problems within the field of knowledge, to respond to diverse professional and social needs.

Recognise one's own limitations and the need to maintain and update professional competence, placing particular emphasis on self-learning of new knowledge based on available scientific evidence.

Show skills in the safe use of medicines taking into account their physical and chemical properties including any risks associated with their use.

Transmit ideas, analyse problems and solve them with critical spirit, acquiring teamwork skills and assuming leadership when appropriate.

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. 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 behaviour 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. Toxic effects on the organ of hearing and balance. Toxic effects 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 and environmental toxicology

Occurrence of toxic chemicals in food and environment. Mechanisms of action of toxic chemicals, toxic effects to humans and development of preventive measures before any serious damage.

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 is supplied directly in the laboratory. Students will handle in a report once realized the practices and they will have to overcome a written exam.
1. Pharmaceutical toxicology and databases
1.1. Security in the use of chemical products
1.2. Toxicological databases in Internet
2. Drug extraction from biological fluids
2.1. Identification of toxics
3. Determination of salicylic acid
4. Determination of alcohol in serum by gas chromatography (GC)
5. Determination of benzodiacepines in plasma by LC
6. Determination of trazodone in plasma by colorimetry
7. Determination of phenothiazines in urine by chromatography
8. Determination of theophylline in serum by LC.
9. Determination of paracetamol in plasma by LC.
10. Determination of atmospheric SO2
11.-Determination of fluorides in urine

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Tutorials	3,00
Theory	53,00
Seminar	6,00
Laboratory	28,00
Total hours	**90,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	20,00
Independent study and work	25,00
Preparation of lessons	65,00
Preparation for assessment activities	15,00
Resolution of case studies	10,00
Total hours	**135,00**

TEACHING METHODOLOGY

The development of the course is structured as follows:

Theoretical classes: 2 hours per week in which the teacher 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 periodicallya and guides them in the search of bibliographic sources and in their critical analysis.

Both in the theoretical and practical sessions, examples of the applications of the subject's content will be given in relation to the Sustainable Development Goals (SDG), as well as in the topics proposed for the expository seminars. The goal is to integrate the application of the SDGs into toxicology lessons to provide students with related knowledge and skills, as well as to promote reflection and criticism. Of the 17 SDG, special emphasis will be placed on the following toxicology-related goals: SDG 3, SDG 4, SDG 5, SDG 12, SDG 13 and SDG 17.

EVALUATION

In order to sit for the final written exam, it is mandatory to have completed the laboratory practices.

The **10**% of the grade will be obtained as a result of the preparation and presentation of **seminars and tutorials**. Mark of this section will be kept two consecutive years (for those students who do not pass the subject in the first enrollment). Lack of regular attendance to seminars class or tutoring will be reflected negatively on the score for this section.

About **25**% of the grade corresponds to **laboratory practices** which attendance is mandatory. It includes the participation and preparation of laboratory practical classes, which are assessed by a written exam during the last day of the laboratory practices and will represent 5% of the mark, which will be kept two years (for those students who do not pass the subject in the first enrollment). The other 20% of the mark corresponds to questions and a practice case which will be evaluated on the written final exam.

To evaluate the **theoretical contents**, there will be a midterm exam, corresponding to the first part of the program, in which they could eliminate contents from 5 out of 10 and that represent **30%** of the final grade. The grade of the mild-term exam is kept for the examination of the second round (in the same academic course). Students who have removed contents in the first midterm exam will be assessed only on the final exam of the second part of the theoretical contents, those who have failed the midterm exam go with all the theoretical contents to the final exam.

The other **35%** of the grade will be obtained from the results obtained in the exam corresponding to the **theoretical contents** of the second part of the program (second semester).

It is mandatory to have passed the theoretical exam and have completed the laboratory practice to add seminars to the grade. In order to add up the percentafe of seminars and tutorials, in the theoretical and practical content you must have 5 out of 10. To pass the subject, you must obtain a grade of 5 or higher in the final exam.

Those students who fail the course in the first call, they keep the grade of seminars for the second round (in the same academic course).

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

Evidence of copying or plagiarism in any of the assessable tasks will result in failure to pass the subject and in appropriate disciplinary action being taken. Please note that, in accordance with article 13. d) of the Statute of the University Student (RD 1791/2010, of 30 December), it is the duty of students to refrain from using or participating in dishonest means in assessment tests, assignments or university official documents.

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

REFERENCES

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