COURSE DATA

Data Subject	
Code	36312
Name	Toxicology
Cycle	Grade
ECTS Credits	10.5
Academic year	2019 - 2020

Study (s)

Degree	Center	Acad. year	Period
1211 - D.D. in Pharmacy-Human Nutrition and Dietetics	Faculty of Pharmacy and Food Sciences	4	Annual

Subject-matter

Degree	Subject-matter	Character
1211 - D.D. in Pharmacy-Human Nutrition and Dietetics	1 - Asignaturas obligatorias del PDG Farmacia-Nutrición Humana y Dietética	Obligatory

Coordination

Name	Department
FERNÁNDEZ FRANZÓN, MÓNICA	265 - Prev. Medicine, Public Health, Food Sc.,Toxic. and For. Med.
RUIZ LEAL, MARIA JOSE	265 - Prev. Medicine, Public Health, Food Sc.,Toxic. and For. Med.

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 a) introduction to toxicology, b) toxicokinetics, c) evaluation of toxicity, d) toxicity to organs and systems, e) toxicity of drugs and basic products for therapeutic groups, f) clinical toxicology, g) analytical toxicology, h) food safety and j) laboratory practices

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.

OUTCOMES

LEARNING OUTCOMES

During this course, students should acquire the following abilities and skills:

• Knowledge on basic toxicology

• Ability to raise and solve basic toxicological problems, relating to chemical properties and structures of drugs and sanitarian products.

• Skill and ability to solve toxicological problems

• Knowledge of the toxicological aspects through the possibilities that Internet provides

• Capacity of relation of the presence of toxics in food and drugs in the organism with the adverse effects that they can cause.

• Ability to perform experimental work and to encourage students to continue the scientific and research activity.

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. Compartmental models. Toxicokinetic parameters. 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. Side effects of drugs

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 drugs in 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. Analytical toxicology

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

8. Food safety

Food and toxic substances of natural origin. Biological and chemical contaminants. Food additives and supplements. Toxic derivatives. Food carcinogens. Risks assessment of food.

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. 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

ACTIVITY	Hours	% To be attended
Theory classes	64,00	100
Laboratory practices	28,00	100
Seminars	6,00	100
Tutorials	3,00	100
Development of group work	15,00	0
Development of individual work	10,00	0
Study and independent work	15,00	0
Readings supplementary material	10,00	0
Preparation of evaluation activities	20,00	0
Preparing lectures	64,00	0
Preparation of practical classes and problem	13,50	0
Resolution of case studies	10,00	0
TOTAL	**258,50**	

TEACHING METHODOLOGY

The development of the course is structured as follows:

Theoretical classes: 2-3 hours per weeks 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.

At the end, they have to submit a report to the professor.

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 teacher advises about the general approach to work, in a way that promotes the student's capacity for work, synthesis and research

EVALUATION

The **10**% of the grade will be obtained as a result of the preparation and presentation of **seminars and tutorials**.

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; 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 **20%** of the final grade. The grade of the mild-term exam is kept for the examination of the second call (July). Students who have past 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 **45**% 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), which 15% correspond to food toxicology contents. To pass the theoretical contents of "Toxicology" and "Food Toxicology" each one must have 4 out of 10.

It is mandatory to have passed the theoretical exam and have completed the laboratory practice to add seminars to the grade. 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 (June-July).

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 "Suspended".

REFERENCES

Basic

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- Bello J, López de Cerain A. 2001. Fundamentos de Ciencia Toxicológica. Díaz de Santos, Madrid.
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- Lee A. 2007. Reacciones adversas a los medicamentos. 1 ed. Pharma Editores, Barcelona

Additional

- http://www.aetox.es Asociación Española de Toxicología
- http://busca-tox.com Portal de búsqueda de información toxicológica.
- http://www.aemps.es Agencia Española del Medicamento. Registro de medicamentos.
- http://www.zambon.es/areasterapeuticas/02dolor/WMU_site/TOXC0000.HTM Información sobre medicinas de urgencias.
- http://wzar.unizar.es/stc/toxicologianet/pages/x/search.htm programa de información y formación en toxicología Clínica.
- http://www.ugr.es/~ajerez/proyecto/index.html. Apoyo multimedia a la enseñanza de la toxicología básica. Universidad de Granada
- http://tratado.uninet.edu/indice.html. Principios de Urgencias, Emergencias y Cuidados Críticos.
- http://www.vademecum.es/. Información sobre medicamentos.

ADDENDUM COVID-19

This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council

1. Continguts / Contenidos

Se mantienen todos los contenidos inicialmente programados en la guía docente para las sesiones teóricas.

2. Volum de treball i planificació temporal de la docència / Volumen de trabajo y planificación temporal de la docencia

La guía docente preveía 64 horas de teoría, 28 h de laboratorio, 6 horas de seminario y 3 h de tutorías.

Mantenimiento de la planificación docente.

3. Metodologia docent / Metodología docente

A partir del 16 de marzo, sustitución de la clase presencial por subida al aula virtual de los materiales para esas sesiones (presentaciones power point con explicaciones, links y artículos relacionados). Mismos materiales previstos en la guía original para la docencia presencial; Se mantiene el sistema de tutorías virtuales (atención del profesorado en las 48 horas siguientes.

Seminarios: se mantiene el mismo procedimiento que había antes de la pandemia. Los seminarios se expondrán en aula virtual para que accedan a ellos todos los estudiantes del curso. No hay exposición presencial.

Tutorías: Suministro de casos de seguimiento farmacoterapéutico resueltos. Utilización de tutorías virtuales para atender las dudas de los estudiantes.

4. Avaluació / 4. Evaluación

Se mantiene el porcentaje de cada apartado en la evaluación: 20% nota primer parcial, 10% nota del seminario, 25% nota de prácticas y 45% nota del segundo parcial.

Se mantienen las notas del primer parcial y su porcentaje en el examen final (20%) obtenidas antes de la entrada en vigor del estado de alarma.

Se mantienen las notas del seminario y su porcentaje en el examen final (10%) obtenidas a través de las exposiciones no presenciales o a través de prueba objetiva tipo test a través del aula virtual el día que realicen el examen final.

El porcentaje de la nota de prácticas (5% en examen práctico en laboratorio + 20% examen escrito en examen final) recae exclusivamente en el examen práctico realizado en el laboratorio. Por lo que ahora, el examen práctico realizado en el laboratorio pasa a tener un valor de 25% de la nota final.

Prueba de evaluación final: Se propone un examen de prueba objetiva tipo test a través del aula virtual el día establecido para el examen final.

Si una persona no dispone de los medios para establecer esta conexión y acceder al aula virtual, deberá contactar con el profesorado por correo electrónico en el momento de la publicación de este anexo a la guía docente. Además, si el alumno tiene problemas con la conexión en el momento en que está realizando el examen, deberá comunicarlo a los profesores en el momento del problema.

Mantenimiento del calendario de exámenes previsto.

5. Bibliografia/ 5. Bibliografía

Se mantienen las lecturas recomendadas disponibles en bases de datos que tiene suscrita la UV (requieren VPN en algunos casos) y las recomendadas por los profesores.