

BASIC DETAILS:

Subject:	GREEN AND SUSTAINABLE PHARMACY		
Id.:	33393		
Programme:	DOBLE GRADO EN FARMACIA Y BIOINFORMÁTICA. PLAN 2018		
Module:	OPTATIVAS		
Subject type:	OPTATIVA		
Year:	5	Teaching period:	Primer Cuatrimestre
Credits:	3	Total hours:	75
Classroom activities:	36	Individual study:	39
Main teaching language:	Inglés	Secondary teaching language:	Castellano
Lecturer:		Email:	

PRESENTATION:

This subject deals with the environmental problem that pharmaceuticals and the industry generates. The student will learn to identify several environmental aspects and evaluate the impacts generated during the lifecycle of the pharmaceutical. Furthermore, the student will be able to provide actions that minimize the impacts. Being aware of the problem and being able to provide solutions is important, not only for the formation of the student as pharmacist but also due to the social concern.

PROFESSIONAL COMPETENCES ACQUIRED IN THE SUBJECT:

General programme competences	G01	Ability to express opinions and propose arguments effectively both orally and in writing. Effectively use language skills to express views and formulate arguments both orally and in writing.
	G02	Troubleshooting and decision-making.
	G03	Ability for autonomous learning and self-criticism.
	G04	Ability to effectively use new information and communications technology to improve written and oral presentations and to facilitate data analysis.
	G05	Ability for teamwork, actively contributing to the objectives and the organisation of a team.
	G06	Ability to transfer the knowledge acquired in practical work and skills to the field of work.
	G07	Demonstrate creativity, independence of thought, autonomy.
	G08	Demonstrate critical and analytical ability to conventional approaches of the discipline.
	G09	Demonstrate capacity for innovation, creativity and initiative.
Specific programme competences	E01	Identify, design, collect, analyse and produce active ingredients, drugs and other products and materials related to the health sector.
	E02	Select the appropriate techniques and procedures in the design, implementation and evaluation of reagents and analytical techniques and methods.
	E04	Assess the risks associated with the use of chemicals substances and laboratory processes.
	E05	Conocer las características físico-químicas de las sustancias utilizadas para la fabricación de los medicamentos.
	E07	Conocer y comprender las propiedades características de los elementos y sus compuestos, así como su aplicación en el ámbito farmacéutico.
	E12	Aplicar los conocimientos de Física y Matemáticas a las ciencias farmacéuticas.
	E13	Aplicar técnicas computacionales y de procesamiento de datos, en relación con información referente a datos físicos, químicos y biológicos.
	E15	Evaluate scientific data related to drugs and healthcare products.
	E16	Use statistical analysis applied to pharmaceutical sciences.
	E18	Desarrollar habilidades relacionadas con el uso de los efectos beneficiosos de las plantas medicinales y comprender los riesgos sanitarios asociados con su mal uso.
	E21	Desarrollar habilidades para identificar dianas terapéuticas y de producción biotecnológica de fármacos, así como de uso de la terapia génica.
	E25	Conocer las principales rutas metabólicas que intervienen en la degradación de fármacos.
	E27	Diseñar, optimizar y elaborar las formas farmacéuticas garantizando su calidad, incluyendo la formulación y control de calidad de medicamentos, el desarrollo de fórmulas magistrales y preparados oficinales.
	E28	Aplicar el control de calidad de productos sanitarios, dermofarmacéuticos y cosméticos y materiales de acondicionamiento.
E30	Programar y corregir la posología de los medicamentos en base a sus parámetros	

		farmacocinéticos.
	E32	Conocer la estabilidad de los principios activos y formas farmacéuticas así como los métodos de estudio.
	E33	Conocer las operaciones básicas y procesos tecnológicos relacionados con la elaboración y control de medicamentos.
	E37	Develop health and hygiene analysis (biochemical, food science, microbiological, parasitological) related to general health and with food and environment in particular.
	E38	Evaluar los efectos de sustancias con actividad farmacológica.
	E39	Conocer y comprender las técnicas utilizadas en el diseño y evaluación de los ensayos preclínicos y clínicos.
	E40	Llevar a cabo las actividades de farmacia clínica y social, siguiendo el ciclo de atención farmacéutica.
	E41	Promote the rational use of medication and healthcare products.
	E42	Adquirir las habilidades necesarias para poder prestar consejo terapéutico en farmacoterapia y dietoterapia, así como consejo nutricional y alimentario a los usuarios de los establecimientos en los que presten servicio.
	E44	Understand the management and the characteristics of pharmaceutical assistance in Primary and Specialised Care structures in the Healthcare System.
	E46	Conocer las propiedades y mecanismos de acción de los fármacos.
	E47	Understand the structure and function of the human body as well as the general mechanisms of disease, molecular, structural and functional alterations, syndromic expression and therapeutic tools for restoring health.
	E49	Conocer las técnicas analíticas relacionadas con diagnóstico de laboratorio, tóxicos, alimentos y medioambiente.
	E51	Learn about the foundations of public health and intervene in the activities of health promotion, disease prevention at an individual and collective level and contribute to health education, recognising the determinants of health among the population health, both in terms of genetics as well as sex and lifestyle, demographic, environmental, social, economic, psychological and cultural dependants.
	E52	Know about, understand and apply legal, social and economic conditions related to the health sector and in particular with medication.
	E54	Use efficiently information retrieval techniques for primary and secondary sources of information (including databases using computer).
	E55	Understand and apply management techniques in all aspects of pharmacy.
	E56	Understand the principles and scientific methodology applied to pharmaceutical sciences, including the historic and social role of the pharmacy.
	E63	Elaborar fórmulas magistrales y preparados oficinales.
Regulated profession competences	P01	Identify, design, collect, analyse, control and produce drugs and medication and other healthcare products for human and veterinary use.
	P02	Evaluate the therapeutic and toxic effects of substances with pharmacological activity.
	P03	Know how to apply the scientific method and acquire skills in handling legislation, sources, bibliography, developing protocols and other aspects considered necessary for the critical design and evaluation of preclinical and clinical trials.
	P04	Diseñar, preparar, suministrar y dispensar medicamentos y otros productos de interés sanitario.
	P05	Prestar consejo terapéutico en farmacoterapia y dietoterapia, así como en el ámbito nutricional y alimentario en los establecimientos en los que presten servicios.
	P06	Promote rational use of medicines and healthcare products, and acquire basic knowledge in clinical management, health economics and efficient use of healthcare resources.
	P08	Llevar a cabo las actividades de farmacia clínica y social, siguiendo el ciclo de atención farmacéutica.
	P09	Intervenir en las actividades de promoción de la salud, prevención de enfermedad, en el ámbito individual, familiar y comunitario; con una visión integral y multiprofesional del proceso salud-enfermedad.
	P13	Develop information and communication skills, both oral and written, to deal with patients and users of the centre where the professional activity is conducted.
	P15	Recognise the limitations and the need to maintain and update professional skills, with particular emphasis on self-learning of new knowledge based on the available scientific evidence.

PRE-REQUISITES:

The activities of this course are based on the knowledge and skills acquired in previous courses. Students must ensure that executes and delivers the requested work and activities, including

laboratory work, applying the skills acquired in previous courses.

SUBJECT PROGRAMME:

Subject contents:

1 - What is Green and Sustainable Pharmacy
1.1 - 1.Introduction
1.2 - Environmental concern
1.3 - Environmental problems caused by drugs and/or pharmaceutical
1.4 - Environmental concepts
1.5 - Green and Sustainable Pharmacy
2 - Framework
2.1 - Introduction
2.2 - Environmental protection agency
2.3 - Chemical regulation in Europe
3 - Pharmaceuticals in the environment
3.1 - Introduction
3.2 - Environmental risk assesment
3.3 - Ecotoxicology
3.4 - Biodergadability
4 - Greener Pharmacy
4.1 - Traditional approach vs Green Pharmacy approach
4.2 - Measuring "greenes" of a pharmaceutical process
4.3 - Green Pharmacy toos
4.4 - Green Chemistry Principles
4.5 - Green Pharmacy in the industry
5 - Life cycle of a pharmaceutical
5.1 - Introduction
5.2 - From public the health perspective
5.3 - From the manufacturing industry perspective
6 - Environmental Management System
6.1 - Environmental Management System
6.2 - Environmental management systems - Requirements with guidance for use (ISO 14001:2004)

Subject planning could be modified due unforeseen circumstances (group performance, availability of resources, changes to academic calendar etc.) and should not, therefore, be considered to be definitive.

TEACHING AND LEARNING METHODOLOGIES AND ACTIVITIES:

Teaching and learning methodologies and activities applied:

Theoretical sessions

The theoretical sessions will be based on the active learning methodology. The lecturer will help students learning and progress by orally discussing some of the main theoretical content of the course, using ICTs and providing the needed resources. Collection of student exercises, problems and materials that must be carried out throughout the course as individual work, as well as guidelines and directions to execute them properly will be also provided. On the other hand, students will do a number of activities during the sessionsthat help to create a learning portfolio.

The methodology of the theoretical sessions will be the following:

- Learning outcomes and evaluation criteria will be provided as well as subject content at the beginning of each session/ unit, including vocabulary and communicative language skills that will be practiced through the session/ unit.

- Some of the content will be lectured. However, the student will usually have to look for the information elsewhere through a number of projects or activities specifically designed for this aim.
- Finally, some activities, problems, cases or any other task will be completed by the student as the culmination of what he/ she has learned during the session/ unit.

Laboratory experiments

Students will have to design experiments, basing on the guidelines provided by the lecturer. Furthermore, the laboratory notebook will be written and results discussed. Student will have to demonstrate autonomy and self-confidence. After conducting experiments, students will perform the mathematical treatment of the results and set them out in a report that will include the discussion and interpretation.

Tutoring sessions

These sessions are designed for the student to solve any doubts that may arise in relation to the subject. In addition the student may request guidelines for learning in these sessions, as well as expanding literature. They may also be useful in performing the proposed activities and projects, since the teacher can monitor the progress of work and orient.

Student work load:

Teaching mode	Teaching methods	Estimated hours
Classroom activities	Master classes	11
	Other theory activities	10
	Coursework presentations	5
	Laboratory practice	10
Individual study	Tutorials	1
	Individual coursework preparation	7
	Group coursework preparation	10
	Project work	12
	Portfolio	9
Total hours:		75

ASSESSMENT SCHEME:

Calculation of final mark:

Written tests:	30 %
Individual coursework:	40 %
Trabajo experimental:	30 %
TOTAL	100 %

*Las observaciones específicas sobre el sistema de evaluación serán comunicadas por escrito a los alumnos al inicio de la materia.

BIBLIOGRAPHY AND DOCUMENTATION:

Basic bibliography:

ANASTAS, Paul. WARNER, John. Green Chemistry. theory and practice. Oxford University Press, 2000
 SANGHI, Rashmi. SINGH, Vandana. Green Chemistry for Environmental Remediation. John Wiley
 KÜMMERER, Klaus. HEMPEL Maximilian. Green and Sustainable Pharmacy. Springer, 2010
 WALKER, C.H. HOPKIN, S.P. Principles of ecotoxicology. Taylor Francis, 2012.
 NEWMAN, Michael. UNGER, Michael. Fundamentals of ecotoxicology. Lewis Publisher. 3^a Edition

Recommended bibliography:

JORGENSEN, Sven Erik. Ecotoxicology: a derivative of encyclopedia of ecology. Elsevier Academic Press, 2010.

Recommended websites:

Norman network	http://www.norman-network.net/index_php.php
Institut Català de Recerca de l'Aigua Recerca i Innovació per a l'ús sostenible de l'aigua	http://www.icra.cat/
Green Chemistry network	http://www.greenchemistrynetwork.org/
Planta Pílogo de Química Fina. Universidad de Alcalá	http://www.ppqf.net/
Center for Green Chemistry at Yale	http://www.greenchemistry.yale.edu/
OECD Guidelines for the testing of Chemicals	http://www.oecd-ilibrary.org

* Guía Docente sujeta a modificaciones