UNIVERSIDAD DE CASTILLA - LA MANCHA

GUÍA DOCENTE

1. General information

Course: PHARMACEUTICAL CHEMISTRY II
Code: 14324
Type: CORE COURSE
ECTS credits: 6
Degree: 376 - UNDERGRADUATE DEGREE PROGRAMME IN PHARMACY
Academic year: 2022-23
Center: 14 - FACULTY OF PHARMACY
Group(s): 10
Year: 3
Duration: C2
Main language: Spanish
Second language: English
Use of additional languages:
English Friendly: Y
Web site:
Bilingual: N

Lecturer: **JOAQUIN CALIXTO GARCIA MARTINEZ** - Group(s): **10**

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Lecturer: **ANA MARÍA SOUSA HERVÉS** - Group(s): **10**

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Lecturer: **JUAN TOLOSA BARRILERO** - Group(s): **10**

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2. Pre-Requisites

No prerequisites are established for this subject although it is recommended that the student has previously passed the subjects of Organic Chemistry I and II, Biochemistry I and II, Physical Chemistry I and II and Pharmaceutical Chemistry I.

3. Justification in the curriculum, relation to other subjects and to the profession

Pharmaceutical Chemistry is the discipline responsible for the design, synthesis and development of molecules with biological activity and drugs for therapeutic purposes. In this sense, this subject is very important in the training of graduates in pharmacy. This is a subject that requires a solid previous knowledge of organic chemistry, biochemistry and physico-chemistry, and the knowledge acquired from it will be used in subjects such as pharmacology, bioinformatics, biopharmacy and pharmacokinetics, among others.

4. Degree competences achieved in this course

Course competences

Code	Description
B01	Proficiency in a second foreign language at level B1 of the Common European Framework of Reference for Languages.
B02	Knowledge of Information and Communication Technologies (ICT).
B03	A correct oral and written communication
B04	Ethical commitment and professional deontology.
B05	Ability to develop those learning skills necessary to undertake further studies.
EQ01	Identify, design, prepare, analyse and produce active principles, drugs and other materials and products of sanitary interest.
EQ03	Complete standard laboratory processes including the employment of scientific equipment related to synthesis and analysis.
EQ04	Evaluate risks/hazards associated to the use of chemical substances and lab processes.
G01	Identify, design, obtain, analyze, control and produce drugs and medicines, as well as other products and raw materials of sanitary interest for human or veterinary use.
G02	Evaluate the therapeutic and toxic effects of substances with pharmacological activity.
G03	Know how to apply the scientific method and acquire skills in the handling of legislation, sources of information, bibliography, elaboration of protocols and other aspects considered necessary for the design and critical evaluation of preclinical and clinical trials.
G04	Design, prepare, supply and dispense medicines and other products of health interest.
G05	Provide therapeutic advice in pharmacotherapy and dietotherapy, as well as in the nutritional and food field in the establishments where they provide services.
G06	Promote the rational use of medicines and medical devices, as well as to acquire basic knowledge in clinical management, health economics and the efficient use of health resources.
G07	Identify, evaluate and assess problems related to drugs and medicines, as well as participate in pharmacovigilance activities.
G08	Conducting clinical and social pharmacy activities, following the pharmaceutical care cycle.
G09	Intervene in health promotion and disease prevention activities at the individual, family and community levels, with an integral and multi-professional vision of the health-disease process.
G10	Design, apply and evaluate clinical reagents, methods and analytical techniques, knowing the basic principles of clinical analysis and

	the characteristics and contents of laboratory diagnostic reports.
G11	Evaluate the toxicological effects of substances and design and apply appropriate tests and trials.
G12	Develop hygienic-sanitary analyses, especially those related to food and environment.
G13	Develop communication and information skills, both oral and written, to deal with patients and users of the centre where they carry out their professional activity. Promote the capacity to work and collaborate with multidisciplinary teams and those related to other health professionals.
G14	Know the ethical and deontological principles according to the legislative, regulatory and administrative provisions governing professional practice, understanding the ethical implications of health in a changing social context.
G15	Recognise own limitations and the need to maintain and update professional competence, with particular emphasis on self-learning of new knowledge based on scientific evidence.
T01	Critical thinking skills based on the application of the scientific method
T02	Ability to manage quality scientific information, bibliography, specialized databases and resources accessible through the Internet.
T03	Handling of basic and specific software for the treatment of information and experimental results.
T04	Motivation for quality, safety at work and awareness of environmental issues, with knowledge of the internationally recognised systems for the correct management of these aspects.
T05	Organizational, planning and implementation skills.
T06	Ability to address human resources decision-making and management.
T07	Ability to work as a team and, where appropriate, exercise leadership functions, encouraging entrepreneurship.
T08	Develop interpersonal skills and the ability to function in an international and multicultural context.

5. Objectives or Learning Outcomes

Course learning outcomes

Description

Acquisition of basic skills in synthesis and analytical characterization of drugs in a practical level.

Ability to find and analyze scientific information regarding the chemical aspects of drugs.

ability to associate the structure of drugs with their mechanism of action and their therapeutic activity at the molecular level.

ability to define the pharmacophore group of a set of active molecules.

ability to design synthetic routes to prepare drugs

ability to propose chemical transformations of drugs aimed at optimizing their pharmacokinetic properties and their biological activity.

ability to predict the metabolic transformations suffered by drugs inside the body.

ability to name drugs and to represent their structure from the systematic nomenclature

6. Units / Contents

Unit 1: Chemotherapy enzyme inhibitors I

- **Unit 1.1** Inhibitors related with folic acid
- **Unit 1.2** Inhibitors of purines and pyrimidines synthesis
- **Unit 1.3** Inhibitors related with polymeration of nucleic acid
- **Unit 1.4** Inhibitors of neuraminidase
- **Unit 1.5** Synthesis

Unit 2: Chemotherapy enzyme inhibitors II. Penicillin and Cephalosporins

- **Unit 2.1** Inhibitors of Biosynthesis of UDP-N-Acetylmuramoil pentapeptide
- **Unit 2.2** Inhibitors of 2nd and 3er stage of synthesis of peptidoglycan
- **Unit 2.3** Inhibitors of 4th stage of synthesis os peptidoglycan
- **Unit 2.4** Synthesis

Unit 3: Pharmacodinamic enzime Inhibitors

- **Unit 3.1** Inhibitors of Angiotensin-converting enzyme
- **Unit 3.2** Inhibitors of GABA-T
- **Unit 3.3** Inhibitos of carbonic anhydrases
- **Unit 3.4** Inhibitors of cyclooxigenase
- **Unit 3.5** Synthesis

Unit 4: Drugs related to transport through the membrane

- **Unit 4.1** Drug that acts on Na+ channels
- **Unit 4.2** Drugs regulators of Ca+ channels
- **Unit 4.3** Drugs that acts on K+ channes
- **Unit 4.4** Inhibitors of H+/K+ ATPase
- **Unit 4.5** Synthesis

Unit 5: Drugs related to the activity of noradrenaline, dopamine, and serotonin

- **Unit 5.1** Adrenalergic drugs
- **Unit 5.2** Dopaminergic drugs
- **Unit 5.3** Serotoninergic drugs
- **Unit 5.4** Synthesis

Unit 6: Drugs related to the activity of acetylcholine

- **Unit 6.1** Cholinergic Receptors and supramolecular interactions
- **Unit 6.2** Clinic used of acetylcholine drugs
- **Unit 6.3** Synthesis

Unit 7: Drugs related to peptides and aminoacid receptors

- **Unit 7.1** GABA-receptors related drugs
- **Unit 7.2** Glutamic receptors related drugs
- **Unit 7.3** Peptides receptors related drugs
- **Unit 7.4** Synthesis

Unit 8: Drugs that acts on histamine receptors

Unit 8.1 H1 Antagonist
Unit 8.2 H2 Antagonist
Unit 8.3 synthesis
Unit 9: Drugs related to the activation of steroid hormons
Unit 10: Drugs related to nucleic acid
Unit 10.1 Alkylanting, intercalating, and non-covalent DNA union agents
Unit 10.2 Tetracyclines
Unit 11: Laboratory Practices

7. Activities, Units/Modules and Methodology

Training Activity	Methodology	Related Competences (only degrees before RD 822/2021)	ECTS	Hours	As	Com	Description
Class Attendance (theory) [ON-SITE]	Combination of methods	B01 B02 B03 B04 B05 G01 G02 G03 G04 G05 G06 G07 G08 G09 G10 G11 G12 G13 G14 G15 T01 T02 T03 T04 T05 T06 T07 T08	0.92	23	Y	N	
Class Attendance (practical) [ON-SITE]	Practical or hands-on activities	B01 B02 B03 B04 B05 EQ01 EQ03 EQ04 G01 G02 G03 G04 G05 G06 G07 G08 G09 G10 G11 G12 G13 G14 G15 T01 T02 T03 T04 T05 T06 T07 T08	0.8	20	Y	Y	
Workshops or seminars [ON-SITE]	Combination of methods	B01 B02 B03 B04 B05 G01 G02 G03 G04 G05 G06 G07 G08 G09 G10 G11 G12 G13 G14 G15 T01 T02 T03 T04 T05 T06 T07 T08	0.52	13	Y	N	
Study and Exam Preparation [OFF-SITE]	Self-study	B01 B02 B03 B04 B05 G01 G02 G03 G04 G05 G06 G07 G08 G09 G10 G11 G12 G13 G14 G15 T01 T02 T03 T04 T05 T06 T07 T08	2.07	51.75	Y	N	
Study and Exam Preparation [OFF-SITE]	Problem solving and exercises	B01 B02 B03 B04 B05 G01 G02 G03 G04 G05 G06 G07 G08 G09 G10 G11 G12 G13 G14 G15 T01 T02 T03 T04 T05 T06 T07 T08	1.53	38.25	Y	N	
Formative Assessment [ON-SITE]	Assessment tests	B01 B02 B03 B04 B05 G01 G02 G03 G04 G05 G06 G07 G08 G09 G10 G11 G12 G13 G14 G15 T01 T02 T03 T04 T05 T06 T07 T08	0.16	4	Y	Y	
		Total:	**6**	**150**			
		Total credits of in-class work: 2.4					**Total class time hours: 60**
		Total credits of out of class work: 3.6					**Total hours of out of class work: 90**

As: Assessable training activity
Com: Training activity of compulsory overcoming (It will be essential to overcome both continuous and non-continuous assessment).

8. Evaluation criteria and Grading System

Evaluation System	Continuous assessment	Non-continuous evaluation*	Description
Assessment of active participation	10.00%	10.00%	
Test	70.00%	70.00%	
Laboratory sessions	20.00%	20.00%	
Total:	**100.00%**	**100.00%**	

According to art. 4 of the UCLM Student Evaluation Regulations, it must be provided to students who cannot regularly attend face-to-face training activities the passing of the subject, having the right (art. 12.2) to be globally graded, in 2 annual calls per subject , an ordinary and an extraordinary one (evaluating 100% of the competences).

9. Assignments, course calendar and important dates

Not related to the syllabus/contents

Hours	hours
Class Attendance (theory) [PRESENCIAL][Combination of methods]	23
Class Attendance (practical) [PRESENCIAL][Practical or hands-on activities]	20
Workshops or seminars [PRESENCIAL][Combination of methods]	13
Study and Exam Preparation [AUTÓNOMA][Self-study]	51.75
Study and Exam Preparation [AUTÓNOMA][Problem solving and exercises]	38.25
Formative Assessment [PRESENCIAL][Assessment tests]	4

Global activity

Activities	hours
Class Attendance (practical) [PRESENCIAL][Practical or hands-on activities]	20
Class Attendance (theory) [PRESENCIAL][Combination of methods]	23
Workshops or seminars [PRESENCIAL][Combination of methods]	13
Study and Exam Preparation [AUTÓNOMA][Self-study]	51.75
Study and Exam Preparation [AUTÓNOMA][Problem solving and exercises]	38.25
Formative Assessment [PRESENCIAL][Assessment tests]	4
Total horas:	150

10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
A. Korolkovas	Fundamentos de la Química Farmacéutica	Ed. Reverté			1978	
C. Avendaño	Introducción a la Química Farmacéutica	Ed. Interamericana-McGraw-Hill.			2001	
D. Lednicer	Organic Chemistry of Drug Synthesis	Ed. Wiley			1999	
G. L. Patrick	An Introduction to Medicinal Chemistry	Oxford University Press			2001	
March, Jerry	Advanced organic chemistry : reactions, mechanisms and struc	John Wiley & Sons		0-471-60180-2	1992	
R. B. Silverman	The Organic Chemistry of Drug Design and Drug Action	Academic Press,			1992	
Vollhardt, K. Peter C.	Química orgánica : estructura y función	Omega		978-84-282-1431-5	2007	
W. O. Foye	Principios de Química Farmacéutica	Ed. Reverté			1988	