COURSE DATA

DATA SUBJECT

Code: 33157
Name: Molecular pharmacology
Cycle: Undergraduate Studies
ECTS Credits: 4.5
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1109 - Degree in Biochemistry and Biomedical Sciences	Facultat de Ciències Biològiques	4	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1109 - Degree in Biochemistry and Biomedical Sciences	Materia de asignaturas optativas	ELECTIVES

COORDINATION

APOSTOLOVA ATANASOVSKA NADEZDA

SUMMARY

This subject will allow the student to gain essential knowledge about the action principles of drugs from a molecular perspective. To achieve this, the most recent experimental approximations will be studied, those regarding the action mechanisms of drugs at molecular and cellular levels and those regarding the identification of new therapeutic targets. The different drug families will be addressed, considering various biological targets with which they interact and taking into account their pharmacological activity, pharmacokinetic, therapeutic aspects and adverse effects. A special attention will be payed to the validation methods in the development of new drugs and to the use of specialized data bases.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

OTHER REQUIREMENTS

COMPETENCES / LEARNING OUTCOMES

1101 -

Capacidad para trabajar correctamente en los laboratorios de Biomedicina incluyendo seguridad, manipulación, eliminación de residuos y registro anotado de actividades.

Conocer las variables de interferencias intra- y extra-analíticas (nutrientes, fármacos, patologías) en los métodos habituales del laboratorio.

Conocer los organismos patógenos de humanos, las patologías que provocan y conocer los fundamentos de las principales estrategias terapéuticas.

Conocer los principales grupos farmacológicos, aplicaciones terapéuticas, mecanismos moleculares de acción y sistemas de transducción de la señal.

Conocer los principales métodos y técnicas experimentales aplicadas al estudio de la salud y enfermedad humanas, su etiología y la efectividad de los tratamientos.

Conocer los principios básicos de la farmacogenética.

Conocer los principios básicos de la interacción fármaco-receptor y los aspectos cuantitativos de la acción de los fármacos.

Tener una visión integrada de las técnicas y métodos utilizados por las ciencias Biomédicas.

Utilización de terminología específica de la biomedicina.

DESCRIPTION OF CONTENTS

1. INTRODUCTION TO PHARMACOLOGY

TOPIC 1. Therapeutic principles. Definition and classification of drugs.

TOPIC 2. MOLECULAR ASPECTS OF THE INTERACTION OF DRUGS WITH THEIR BIOLOGICAL TARGETS. Target proteins for the union of drugs: receptors, chanels, enzymes, transport molecules. Other pharmacological targets.

TOPIC 3. BASIC PRINCIPLES OF BIODISPONIBILITY AND PHARMACOKINETICS (LADME). Liberation, absorption, distribution, metabolism and elimination of drugs.

TOPIC 4. DEVELOPMENT OF NEW DRUGS. Basic design principles and molecular modelization of new drugs. Obtaining methods. Preclinic development. Basic principles of clinical trials.

2. DRUGS ACTING ON RECEPTORS

TOPIC 5. Types of receptors. Drug-receptor interaction. Concepts of agonist, antagonist, parcial agonist and inverse agonist. Quantitative aspects of the drug-receptor interaction. Determination of characteristic parameters of the linking receptor-ligand interaction.

TOPIC 6. PHARMACOLOGICAL REGULATION OF VOLTAGE-DEPENDENT IONIC CHANELS.

TOPIC 7. PHARMACOLOGICAL REGULATION OF IONIC CHANELS CONTROLED BY LINKING.

TOPIC 8. PHARMACOLOGICAL REGULATION OF G PROTEIN-COUPLED RECEPTORS (GPCRs).

TOPIC 9. PHARMACOLOGICAL REGULATION OF CATALYTIC RECEPTORS.

TOPIC 10. PHARMACOLOGICAL REGULATION OF NUCLEAR RECEPTORS.

3. DRUGS ACTING ON OTHER PHARMACOLOGICAL TARGETS

TOPIC 11. ENZYMES AS TARGETS OF THE DRUG ACTION. Therapeutic applications of the enzymatic activation and inhibition. Main groups of drugs acting at this level.

TOPIC 12. DRUGS ACTING ON TRANSPORT MOLECULES.

TOPIC 13. Drugs acting at DNA level. Molecular basis for antibacterian action, antimicotics, antivirics and antiparasitics. Molecular basis of antineoplastic chemotherapy.

TOPIC 14. BIODRUGS. Proteins and polypeptides. Monoclonal antibodies. Use of genes for therapeutic aims.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Tutorials	3,00
Theory	30,00
Laboratory	12,00
Total hours	**45,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	0,00
Independent study and work	30,00
Preparation of lessons	15,50

Preparation for assessment activities	10,00
Resolution of case studies	12,00
Total hours	**67,50**

TEACHING METHODOLOGY

Theoretical classes: basically, the model of master class together with the heuristic method will be used to present fundamental concepts and the most relevant contents of the subject, using audiovisual media to develop them. Previous to the theory classes, teachers will provide students with bibliographic and audiovisual material in the teaching support platform "Virtual Classroom". There will be a total of 20 one-hour sessions. The participative method will be encouraged by asking students either at the beginning or at the end of every topic / unit subject matter to solve some questions; they will serve for the autoevaluation and / or the continued evaluation of the student.

Practical laboratory sessions: There will be a total of three sessions lasting 4 hours each. During these sessions the drug action mechanisms will be analysed, together with their pharmacological effects and the characteristic parameters of the drug-receptor interaction by carrying out "in vivo" and "in vitro" experiments, by using support videos and specific computer simulation programmes.

Seminars: The method of "problems based learning" will be applied. Different problems will be proposed to reinforce diverse aspects related with the theoretical content of the syllabus. The students will be asked to solve them and then discuss them on site under teacher supervision, which will imply an active participation on behalf of the student. A total of 6 one-hour sessions will be carried out.

Tutorials: The tutorials are organized in reduced student groups according to the established calendar. In them the teacher may ask individually or collectively specific questions, which will be more complex than the ones solved in normal seminars, according to the students' needs. Moreover, the tutorials will help solve any doubts derived from the theory classes and will assess students on strategies to overcome any difficulty that may appear. A total of 3 one- hour sessions will be carried out.

EVALUATION

In the students' learning evaluation all the aspects exposed in the teaching methodology section of this guide will be taken into account and it will be done in a continuous way by the teacher.

55% of the mark: will come from the mark of the theoretical exam (50%) and of the continuous evaluation of questions solved during the year (5%).

25% of the mark: will come from the mark of the practical sessions. This mark will be given taking into account the student's participation, the work in the laboratory and the exam mark. If the student does not pass the exam, this mark will only be kept until the following year.

15% of the mark: will come from the evaluation of the work done in seminars.

5% of the mark: will come from the teacher's direct evaluation in tutorials.

In order to pass the subject it is necessary to have done and passed the practical sessions and the theoretical exam.

REFERENCES

- Referencia b1: Lorenzo P. y cols. Velázquez. Farmacología Básica y Clínica. 19ª ed. Med. Panamericana, 2018. Referencia b2: Florez J. Farmacología humana 6ª ed. Elsevier Masson, 2013. Referencia b3: Rang y Dale. Farmacología. 9ª ed. Elsevier, 2019. Referencia b4: Katzung B. G. Farmacología básica y clínica. 15ª ed. McGraw-Hill, 2021. Referencia b5: Fernández Alfonso S. y Ruiz Gallo M. Fundamentos de Farmacología básica y clínica. 3ª ed. Panamericana, 2023. Referencia b6: Goodman y Gilman. Las bases farmacológicas de la terapéutica. 14ª ed. McGraw-Hill, 2023. Referencia b7: Golan DE Tashijan AH, Armstrong EJ, Armstrong AW. Principios de Farmacología : Bases fisiopatológicas del tratamiento farmacológico. 4ª ed. Wolters Kluver, 2017. Referencia b8 Brenner y Stevens. Farmacología básica. 6ª ed. Elsevier, 2023. Referencia b9: Offermanns S. y Rosenthal W. Encyclopedia of Molecular Pharmacology . 2ª ed. Springer, 2008.

- Referencia c1: Annual Review of Pharmacology and Toxicology (Journal) ISSN: 0362-1642 Referencia c2: Pharmacological Reviews (Journal) ISSN: 0031-6997 Referencia c3: Molecular Pharmacology (Journal) ISSN: 0026-895X Referencia c4: Trends in Pharmacological Sciences (Journal) ISSN: 0165-6147 Referencia c5: Biochemical Pharmacology (Journal) ISSN: 0006-2952 Referencia c6: British Journal of Pharmacology (Journal) ISSN: 1476-5381 Referencia c7: Nature Reviews Drug discovery (Journal) ISSN: 1474-1776