1. OVERVIEW

Subject Area	Pharmacogenetics and Pharmacogenomics
Degree	Bachelor's Degree in Biotechnology
School/Faculty	School of Biomedical and Health Sciences
Year	4
ECTS	6
Type	Optional
Language(s)	Spanish
Delivery Mode	On campus
Semester	S2
Academic Year	24-25
Coordinating professor	Noelia Pinal Seoane

2. INTRODUCTION

The varying traits in human beings, such as eye or hair colour, height, and so on is determined by the genome which is unique to each individual. The genome does not only affect visible physical characteristics but also has been seen to affect patient response to drugs, in some cases leading to a poor or no response and in some cases, even to toxicity.

Pharmacogenetics and pharmacogenomics are disciplines which deal with studying how the genetic variability of patients or a population group affects the response to a pharmacological treatment. Thanks to these disciplines, the pharmaceutical industry can improve and develop new drugs which are more effective, giving rise to what is called personalised or genomic medicine.

In this subject we will study how individual genetic characteristics can affect pharmacological treatment, together with how different types of genetic markers have been identified which can help us to understand these differences and adapt treatment to different patients.

We will also study technologies used to determine genetic components which define the different responses to drugs. Also, we see how pharmacogenetics and pharmacogenomics have affected clinical practice and the pharmaceutical industry. Finally, we evaluate how this may affect society today and in the future.

3. LEARNING OUTCOMES (RA, by the acronym in Spanish)

KNOWLEDGE (CON, by the acronym in Spanish)

CON04. Identify the techniques and principal methods of cell cultures, protein analysis from a biotechnology standpoint and genetic bases and their application in industry.

• Know the pharmacogenetic basis that supports the interindividual differences in the pharmacological response, whether therapeutic or toxic.

ABILITIES (HAB, by the acronym in Spanish)

HAB04. Design experimental procedures and protocols choosing the most suitable technique in the field of biotechnological research, all the while meeting quality and legislative standards.
· Apply the knowledge of pharmacogenetics and individual pharmacological therapy for their optimisation.

SKILLS

COMP19. Analyse and examine the properties and mechanisms of action of drugs.

COMP25. Analyse the influence genetic variability on all levels has on drug activity.

4. CONTENTS

· Introduction to Genomic Medicine.
· Applications of Genomic Medicine.
· Pharmacogenomics and Pharmacogenetics.
· Genomic Medicine and Society.

This subject area is divided into four learning units, which are then divided into various topics:

• **Unit 1: Introduction to Genomic Medicine**
- Topic 1: Genetic basis applied to pharmacogenetics and personalised medicine.
- Topic 2: Biomarkers and techniques applied to their detection.

• **Unit 2: Pharmacogenomics and Pharmacogenetics.**
- Topic 3: Genes involved in the metabolism of drugs.
- Topic 4: Target genes for the therapeutic response of the drug.

• **Unit 3: Applications of personalised medicine.**
- Topic 5: Pharmacogenetics in the pharmaceutical industry.
- Topic 6: Pharmacogenetics in oncology.
- Topic 7: Pharmacogenetics in psychiatry.
- Topic 8: Pharmacogenetics in cardiovascular diseases.
- Topic 9: Pharmacogenetics in other disorders.
- Topic 10: Personalised medicine.

• **Unit 4: Genomic Medicine and Society.**
- Topic 11: Ethical aspects arising from the development of personalised medicine.

5. TEACHING/LEARNING METHODS

The types of teaching/learning methods are as follows:

- Lecture
- Case studies
- Collaborative learning
- Learning based on workshop teaching

6. LEARNING ACTIVITIES

The types of learning activities, plus the amount of time spent on each activity, are as follows:

On campus:

Learning activity	Number of hours
Asynchronous lectures	33
Asynchronous master lectures	12
Debates and discussions	4
Case Studies	6
Problem-solving	8
Written reports and essays	5
Tutorials	15
Independent working	52
Workshops and/or lab work	10
On-campus knowledge tests	5
TOTAL	**150**

7. ASSESSMENT

The assessment methods, together with how much they each count towards the final grade for the subject area, are as follows:

On campus:

Assessment system	Weighting
On-campus knowledge tests	60
Laboratory practice	15
Case study/problem scenario	10
Reports and written work	10
Spoken presentations	5

On the Virtual Campus, when you open the subject area, you can see all the details of your assessment activities and the deadlines and assessment procedures for each activity.

7.1. Ordinary exam period

To pass the subject area in the ordinary exam period you must obtain a mark of 5.0 or more out of 10.0 in all assessed parts of the subject. Any part you do not pass in the ordinary exam period will need to be recovered in the extraordinary exam period (resits).

Your final grade will be the average of the partial marks in each of the learning activities you have passed. The continuous assessment system for the learning activities requires attendance to at least 50% of the classes.

It is compulsory for students studying degrees on-campus to accredit attendance to at least 50% of classes. This requirement qualifies students for the right to obtain academic counselling, support and monitoring from the professor. Failure to accredit attendance to at least 50% of the classes by any of the means proposed by the University will mean that the professor awarding a fail to the student for that subject area in the ordinary exam period in accordance with the grading system outlined in these regulations. All of the above, without prejudice to the other requirements or higher attendance percentages that other faculties may stipulate in their learning guides or internal regulations. Regulations for the assessment of official degree programmes, Art. 1 point 4.

(*https://universidadeuropea.com/documents/1798/6.__Reglamento_evaluacion_titulaciones_oficiales_grado_UEM_v2.pdf*)

7.2. Extraordinary exam period (resits)

To pass the subject area in the extraordinary exam period (resits), the students must obtain a mark equal to or above 5.0 out of 10.0 in all parts of the subject assessment they did not pass during the ordinary exam period.

The student must submit the activities not passed in the ordinary exam period taking into account the corrections or comments made by the teacher. The student must also submit any activities which were not submitted.

The final grade will be the average of the partial marks in each of the activities passed (with a mark equal to or higher than 5 out of 10). The marks for the assessable activities the student passed in the ordinary exam period will be maintained for calculating this grade.

8. TIMELINE

The timeline with delivery dates of assessable activities in the subject area is indicated in this section:

Assessable activities	Date
Activity 1: Laboratory practice Detecting polymorphisms	Week 3-4
Activity 2. Case Studies	Week 3-4

Knowledge test 1	Week 7-8
Activity 3: Problem-solving	Week 9-10
Activity 4: Case Studies	Week 10-11
Activity 5: Laboratory practice Fly avatar	Dates to be decided
Activity 6. Debates and discussions	Week 14-15
knowledge test ordinary exam period	Ordinary exam period

The timeline may be subject to modifications for logistical reasons of the activities. Students will be informed of any changes in due time and course.

9. BIBLIOGRAPHY

The recommended bibliography is indicated below:

• Werner Kalow, Urs Meyer, and Rachel Tyndale. Pharmacogenomics. Taylor and Francis. ISBN-9780824705442. 2005.

• Altman RB, Flockhart D & Goldstein DB. Principles of pharmacogenetics and pharmacogenomics. ISBN 978-0-521-88537-9. Cambridge. Cambridge Press. 2012.

• Anke-Hilse Maitland-van der Zee, Ann K. Daly. Pharmacogenetics and Individualized Therapy. John Wiley & Sons, Inc. ISBN-9780470433546. 2012

• Martin M. Zdanowicz. Concepts in Pharmacogenomics. American Society of HealthSystem Pharmacist, Inc. ISBN- 9781585282340. 2010

10. EDUCATIONAL GUIDANCE AND DIVERSITY UNIT

The Educational Guidance and Diversity Unit (ODI in Spanish) offers support throughout your time at university to help you with your academic achievement. Other cornerstones of our educational policy are the inclusion of students with special educational needs, universal access in all our university campuses and equal opportunities.

This ODI unit offers students:

1. Support and monitoring through counselling and personalised student plans for those who need to improve their academic performance.
2. Curricular adaptations to uphold diversity, with assistance for those students who require specific educational support, leading to equal opportunities without significant changes to methodology or evaluation.
3. We offer students a range of extracurricular educational resources to reinforce skills which will enhance their personal and professional development.

4. Career guidance by offering tools and advice to students with doubts regarding their professional careers or those who believe they have chosen the wrong line of study.

Students who need educational support can contact us at:
orientacioneducativa@universidadeuropea.es

11. SATISFACTION SURVEYS

Your opinion matters!

Universidad Europea encourages you to complete our satisfaction surveys to identify strengths and areas for improvement for staff, degree courses and the learning process.

These surveys will be available in the surveys area of your virtual campus or by email.

Your opinion is essential to improve the quality of the degree.

Many thanks for taking part.