Syllabus

Edition 2016-17

1. SUBJECT DESCRIPTION

Degree:	**Biotechnology**
Course:	**Pharmacology and Toxicology**
Department:	**Physiology, Anatomy and Cell Biology**
Year:	**2016-17**
Semester:	**2nd semester (spring semester)**
ECTS credits:	**6**
Course:	**3rd**
Type:	**Optional**
Language:	**English**

Model:	**A2**
a. Basic Teaching (BT):	**70%**
b. Practical teaching (PT):	**15%**
c. Seminars (SM):	**15%**

Syllabus

Edition 2016-17

2. Professors

2.1. Coordinator: J uan Carlos Rodriguez Aguilera

2.2. Teachers	
Name:	**J uan Carlos Rodriguez Aguilera**
School:	**Experimental Sciences**
Department:	**Physiology, Anatomy and Cell Biology**
Area:	**Cell Biology**
Category:	**Senior Lecturer**
Office hours:	**Wednesdays and Fridays 11:30-14:30. Previous appointment required**
Office:	**Building 21; Office 1.07**
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Phone:	**954 349380**

3. TRAINING PLAN

3.1. Goals

- To understand the basic mechanisms involved in drug toxicity
- To predict drug clearance rates
- To trace drug biotransformation and its secondary metabolites
- To design effective drug dose-dependent curves
- To select most effective drug administration modes

3.2. Contribution to training plan

The possibility of establishing new therapies and treatments for diseases depends largely on the possibility of obtaining effective, specific, abundant, low-cost drugs.
For a drug to be marketed, it is necessary to conduct multiple experimental studies showing drug effectiveness and possible side-effects or even toxicity.

This course is an introduction to the basic knowledge of pharmacology and toxicology oriented to biomedical and biotechnological fields. Particular attention will be paid to kinetics and dynamics of both drugs and toxics. Concepts of clearance, timing and dosage will be stressed. Detoxification and drug biotransformation, as well as excretion, will be showed as real models for drug discovery.

In this way, students will gain knowledge of metrics, pharmacokinetics and pharmacodynamics, and also basic skills required in the study of these areas. Students will be able to determine the magnitude of drug effects through development of dose-response curves.

Finally, drug-drug interactions will be studied, updating classical detoxification metabolic pathways, rate-limiting enzyme activities and basic excretion pathways.

3.3. Recommendations or previous knowledge required

This course is partially supported on knowledge acquired in previous courses. Particularly, those included in Chemistry (chemical equilibria, pKa, logP) Biochemistry (enzyme kinetics, coupled reactions), Physiology (liver and kidney function), and Cell Biology (epithelia structure, gradients across membranes, bioenergetics) areas. A strong background in those subjects is highly recommended.

Basic computer skills (Office suite and Internet browsing) are required.

Syllabus

Edition 2016-17

This course is not a language course. At least B1 level of English is required for this course, although B2 level is strongly recommended. In all written tests (reports, exams and quizzes) minimal grammatical and vocabulary competence will be required (B1 level).

4. COMPETENCES

4.1 Degree competences developed within this subject

- Analysis and synthesis skills
- Information management
- Communication skills: improvement on speech and writing performance

4.2 Course competences to be developed

- Professional skills
  - Development of pedagogical proceeding for science teaching
  - Improvement of computer information management
  - Scheduling and time management

- Attitudes
  - Criticism ability
  - Scientific judgement
  - Teamwork organization and performance

4.3. Subject-specific competences to be developed

- Specialization in pharmacology: pharmacokinetics and pharmacodynamics
- Clearance models based on excretion mechanisms in animals
- Toxicity molecular mechanisms: biological targets

Syllabus

Edition 2016-17

5. CONTENTS (Topics)

BASIC TEACHING

1. Toxicity: phases of intoxication and its evaluation. Toxicology: analytical tools. Therapeutics and drug toxicity.

2. Pharmacokinetics: drug distribution within the body, bioavailability. Transportation models.

3. Pharmacodynamics: mechanisms of action, drug-target interaction, enzymes and other biomolecules..

4. Drug Discovery. Farmacognosy. Origin of pharmacologically-active molecules. Critical factors on drug posology.

PRACTICAL TEACHING

Students will carry out practical activities designed to determine magnitude and effectiveness of pharmacological substances, side-effects and toxicity.

Practical teaching sessions will include:

- Session 1: *In vitro* toxicity tests.
- Session 2: Pharmacokinetics. Clearance: simple vs. complex models.
- Session 3. Metabolic detoxification: analysis of secondary metabolites.

SEMINARS

Seminars integrate both basic and practical teaching. Sessions will include activities related to teaching sessions. A practical project for a clinical trial design will be carried out along sessions.

Seminars sessions will include:

- Clinical trial design and previous calculations
- Problem-solving sessions
- Case-based sessions
- Data analysis and model prediction

Syllabus

Edition 2016-17

6. METODOLOGY AND RESOURCES

This course accounts for 6 ECTS credits (i.e. 150 hours) distributed as follows:

Activities	In-class (session hours)	Off-class (homework hours)	Evaluation (homework hours)	TOTAL
Basic	28	90	15	
Practical	7			
Seminars	10			
TOTAL	**45**	**90**	**15**	**150**

a) Basic teaching

Attendance to basic teaching sessions is voluntary. These include a get-together of the main aspects of each part of the contents, paying attention to the most complex concepts. Session dynamics include frequent student interaction and problem-solving proposals. Some of these problems and others not treated in basic teaching sessions may be proposed as homework.

b) Practical teaching

Attendance to practical teaching sessions is compulsory. These include experimental work in the lab sessions, and related non-experimental tasks as homework.

c) Seminars

Attendance to seminars sessions is voluntary although strongly recommended. These include planning, development and execution of a short project to perform a controlled clinical trial. Activities are carried out by students groups formed early in the spring semester.

d) Timing

Adequate time management is essential. Thus, this subject is scheduled as described hereafter:

Syllabus

Edition 2016-17

d1) Basic teaching sessions will take 28 hours (one hour per session, Wed. & Thu. at 1 pm, classroom to be determined):

- 1 kick-off session, for presentation and introduction to course rules
- 27 sessions to go through four monthly topics along the academic spring semester

Week	Wednesday	Thursday	Topic
1	25/01/2017	26/01/2017	Kick-off & Topic#1
2	01/02/2017	02/02/2017	Topic # 1
3	08/02/2017	09/02/2017	Topic # 1
4	15/02/2017	16/02/2017	Topic # 1
5	22/02/2017	23/02/2017	Topic # 1
6	01/03/2017	02/03/2017	Topic # 2
7	08/03/2017	09/03/2017	Topic # 2
8	15/03/2017	16/03/2017	Topic # 2
9	22/03/2017	23/03/2017	Topic # 2
10	29/04/2017	30/03/2017	Topic # 3
11	05/04/2017	06/04/2017	Topic # 3
12	19/04/2017	20/04/2017	Topic # 3
13	26/04/2017	27/04/2017	Topic # 4
14	10/05/2017	11/05/2017	Topic # 4

d2) Practical teaching sessions will take 7 hours. There will be 3 lab sessions (2-3 hours each). Lab sessions will take place on indicated Thursdays at 8 am (laboratory 23.B.04).

Week	Lab sessions
3	02/03/2017
7	06/04/2017
13	27/04/2017

d3) Seminars sessions will take 7 hours. There will be 3 sessions (2-3 hours each). Seminars sessions will take place on indicated Thursdays at 9 am (classroom to be determined).

Week	Sessions
2	02/02/2017
9	16/03/2017
14	11/05/2017

e) Off-class activities and office hours

All off-class activities are evaluated. These must be uploaded using the Virtual Campus tool. All announcements, marks, schedules or homework deadlines will also be run through this web-based learning tool.

Office hours are intended for additional student assistance; this can be either at the office or on-line. However, in any case previous appointment is *always required*.

f) Tips for successful course completion.

• Before each in-class session, please revise the key topic aspects and resources that are available online, search documentation list.

• During the in-class sessions, all doubts should be clarified addressing your questions. Try to obtain the most from the professor's time dedicated to in-class sessions.

• After the in-class sessions, perform your topic reports and revise them through a brief study.

• Keep timing as strict as possible.

• Professors can be consulted during the whole semester either by e-mail, by phone or in-person (office hours)

• Try to understand the biological processes that are covered in all the topics, avoiding memorization of unclear or confusing ideas.

7. EVALUATION

According to University regulations, all written contents in exams, reports and quizzes must be original. Illegal copying of these will be prosecuted and may lead to a fail in the final mark.

The total score of this subject is distributed as follows:

a) Basic teaching (50% of overall course score)
Attendance to the EB sessions is voluntary. This teaching component will be evaluated by written quizzes and two written topic reports.

The basic teaching is evaluated according to a written exam (50% of overall course score). The questions will contain questions falling within one of these categories:

- ***Problem solving***
- ***Short answer***
- Calculated answer
- Pair matching
- Fill-in blanks
- Multiple choice

b) Practices & Seminar sessions (50% of overall course score)

Attendance to the practical sessions is compulsory, unless absence is properly justified (written evidence may be required). Evaluation of these in-class sessions will be based on this **homework**:

- Practical sessions quizzes *(10% of overall course score)*
  The quizzes will contain questions falling within one of these categories:
  - Short answer
  - Long answer
  - Calculated answer
  - Concept matching
  - Combinations
  - Fill-in blanks
  - Scrambled answers
  - Multiple choice
  - True/False
  - Problem-solving

- Seminar sessions project *(40% of overall course score)*
  The project is a teamwork assignment to test the ability to develop a clinical assay model. Evaluation criteria for projects include content, organization and style (rubric available online).

In all written tests (reports, exams and quizzes) minimal grammatical and vocabulary competence will be required (B1 level).

According to University regulations, those students failing the final mark will have a resit exam in July with full score opportunities. The resit exam accounts up to 100% of the final score. The exam will contain questions falling into one of these categories:

- ***Short answer***
- ***Problem-solving***
- Calculated answer
- Concept matching
- Combinations
- Fill-in blanks
- Scrambled answers
- Multiple choice
- True/False

8. RECOMMENDED LITERATURE

Title	Authors	Editorial	Year
Casarett and Doull's toxicology : the basic science of poisons	**Curtis D. Klaassen**	**McGraw-Hill**	**2008**
Pharmacology: principles and practice.	**Miles Hacker, William Messer, Kenneth Bachmann**	**Elsevier-Academic Press**	**2009**

Additional Reading

Basic pharmacology : understanding drug actions and reactions	Maria A. Hernández, Appu. Rathinavelu	CRC, Taylor & Francis	2006
Applied pharmacokinetics & pharmacodynamics : principles of therapeutic drug monitoring	Michael E. Burton... [et al.]	Lippincott Williams & Wilkins	2006