Laboratory of genetic engineering and cell and tissue biongineering

Academic Year: (2020 / 2021) **Review date: 08-07-2020**

Department assigned to the subject: Bioengineering and Aeroespace Engineering Department

Coordinating teacher: GARCIA DIEZ, MARTA

Type: Compulsory ECTS Credits : 4.0

Year : 1 Semester : 2

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Bachelor courses closely related to Biochemistry and/or Cellular and Molecular Biology.

OBJECTIVES

BASIC COMPETENCES

CB6. Acquire knowledge and understanding to provide the basis to develop and/or apply original ideas, often in a research context.
CB7. Apply the acquired knowledge and the ability to solve problems in new contexts within broader (or multidisciplinary) contexts related to their field of study.
CB8. To be able to integrate the acquired knowledge and handle complexity of formulate judgments based on incomplete or limited information, including reflections on social and ethical responsibilities linked to the application of their knowledge and judgments.
CB9. To be able to communicate their conclusions and thoughts to a specialized and non-specialized audience in a clear and unambiguous manner.
CB10. Learn skills that will enable the students to continue their studies.

GENERAL COMPETENCES

CG1. Achieve a multidisciplinary scientific view, with a clear translational orientation and applied to the field of biomedical science and technology.
CG2. Demonstrate a deep theoretical and practical knowledge about both the principles and the most advanced technologies in biomedical sciences.
CG3. Ability to lead and manage groups and research teams and also to promote teamwork, knowledge management and competitive intelligence.
CG4. Ability to analyze, synthesize and apply knowledge to propose original solutions to biomedical problems.
CG5. Develop abilities to identify and understand the social needs and to provide scientific and technological solutions in the biomedical field.
CG6. Identify the keys of technology transfer in the Spanish and in the EU market, and understand the basis for the management and building of a biomedical based company.

SPECIFIC COMPETENCES

CE1. Know the state-of-the-art and future perspectives in both cellular and gene therapies and also in tissue engineering to design and develop experiments in these fields.
CE2. Know in depth the different types of stem cells (natural and induced), for their collection and management, their application in Regenerative Medicine, as well as their present limitations and their foreseeable future development.
CE3. Understand the fundamentals of different genetic tools used for the modification of cellular genomes, know how to use them, and their clinical application.

LEARNING RESULTS

1. Learn how to choose the strategy and the cell type, and also design the appropriate vector for cell/gene therapy applications.
2. Understand and integrate the acquired knowledge in order to apply it for a fast resolution of current and future problems in the field of regenerative medicine, genetic and tissue engineering as well as in biotechnology applied to health. At the end of the course, students must be able to express a reasoned and elaborated scientific-tecnologic opinion and should be able to express it in both written and oral form in front of an expert professional audience.
3. Apply the acquired knowledge to the Biomedical Technologies field.

DESCRIPTION OF CONTENTS: PROGRAMME

PROGRAM: During 2 weeks of theoretical and practical classes in the laboratory, students will analyse scientific literature, carry out various experimental developments, organization and management of scientific results and presentation of the results and limitations found during the development. Finally they will carry out the preparation of a work in scientific format to recapitulate what they have learned during the two experimental weeks.

1. Learning good laboratory practice that are required to work in a Molecular and Cell Biology laboratory: biosafety, waste management, personal protective equipment, asepsy and sterility.
2. Analysis of the literature recommended related to data management and their preparation for publication and/or broadcasting.
3. Cell culture of human cells and gene therapy strategies.
4. In vitro cell migration assays.
5. Tissue processing and decellularization: matrices for Tissue Engineering.
6. Isolation and expansion of stem cells from live tissues.
7. Construction of a modular bioreactor for regenerative medicine.
8. Cell integration into matrices/biomaterials: tissue recellularization.
9. Development of critical thinking for troubleshooting and / or improvements of the learned protocols.
10. Presentation of data in a scientific format.

LEARNING ACTIVITIES AND METHODOLOGY

Attendance to at least 80% of the practices is mandatory.

The program is divided into theoretical sessions, demonstrations, experimental practices, discussion sessions and problems. Students have to read the assigned chapters, articles, problems, etc., before the corresponding classes.

To facilitate learning, students will receive the manual practices and necessary bibliography.
Seminars include discussion of relevant scientific papers and problems, to be submitted by students.

LEARNING ACTIVITIES
- Theoretical classes
- Theoretical-practical classes
- Tutorships
- Group work
- Student´s individual work

TEACHING METHODOLOGIES
- Teacher explanations supported with audiovisual media and information technology, in which the main concepts of the subject are developed and the reference literature is provided to supplement student learning.
- Critical reading of international references recommended by the professor: journal papers, reports and manuals for further discussion in class, to enhance and consolidate the acquired knowledge.
- Solving practical biomedical cases, presented by the professor to the students either individually or in groups.
- Presentation and discussion in class, under the moderation of the professor, of subjects related to the course.
- Reports and projects (working individually or in groups).

ASSESSMENT SYSTEM

Attendance to 80% of sessions is mandatory to be evaluated

Grading:
Total score: 10 points
Continuous assessment: 6 out of 10
final exhibition: 4 out of 10

CONTINUOUS EVALUATION: 60% of the final score of the subject (6 points of total score), and includes several components:
1) Student presentation about "how to prepare technical communications" (Chapter 19). Work in pairs: 1 point
2) Presentation of problems encountered during the development of practices or alternative protocol. Individual work: 2 points
3) Prepare an assay (extended abstract structure). Individual work: 3 points

FINAL EXPOSITION: It covers the full program (including presentations and works) and represents the

40% of the final score. The minimum score in the final exposition to pass the subject is 5 out of 10, regardless of the grade in the continuous evaluation.

EXTRAORDINARY EXAM: The mark for students attending any extraordinary examination will be either a) 100% extraordinary exam mark, or b) 40% extraordinary exam mark and 60% continuous evaluation if it is available on the same course and if the student requests it.

ACADEMIC CONDUCT: Unless otherwise specified, the tests will be closed book, no computer or phone, or anything else other than a writing instrument and the examination itself. Plagiarism, cheating or other acts of academic dishonesty will not be tolerated. Any infringement of any kind will result in a failing grade.

% end-of-term-examination:	40
% of continuous assessment (assigments, laboratory, practicals…):	60

BASIC BIBLIOGRAPHY

- Jeffrey Laurence, Pedro Baptista, Anthony Atala Translating Regenerative Medicine to the Clinic, Academic press, 2015
- Kursad Turksen Stem Cells and Good Manufacturing Practices: Methods, Protocols, and Regulations, Springer, 2015
- Melissa Kurtis Micou, Dawn Kilkenny A Laboratory Course in Tissue Engineering , CRC Press, 2012