



POLITÉCNICA

INTERNATIONAL
CAMPUS OF
EXCELLENCE

COORDINATION PROCESS OF
LEARNING ACTIVITIES
PR/CL/001



E.T.S. de Ingenieros de
Telecomunicacion

ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

93000988 - Regenerative Medicine

DEGREE PROGRAMME

09AU - Master Universitario En Ingenieria Biomedica

ACADEMIC YEAR & SEMESTER

2022/23 - Semester 2

Index

Learning guide

1. Description.....	1
2. Faculty.....	1
3. Skills and learning outcomes	2
4. Brief description of the subject and syllabus.....	4
5. Schedule.....	6
6. Activities and assessment criteria.....	8
7. Teaching resources.....	10
8. Other information.....	10

1. Description

1.1. Subject details

Name of the subject	93000988 - Regenerative Medicine
No of credits	3 ECTS
Type	Optional
Academic year of the programme	First year
Semester of tuition	Semester 2
Tuition period	February-June
Tuition languages	English
Degree programme	09AU - Master Universitario en Ingenieria Biomedica
Centre	09 - Escuela Tecnica Superior De Ingenieros De Telecomunicacion
Academic year	2022-23

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Blanca De Los Reyes Gonzalez Bermudez	CC.Mat- ETSICCP	blanca.gbermudez@upm.es	Th - 11:00 - 14:00 Ask for an specific date by email
Francisco Javier Rojo Perez (Subject coordinator)	CC Mater	fj.rojo@upm.es	Tu - 15:00 - 18:00 Ask for an specific date by email

Nuria Mari Buye	Dpt Cc Mater	nuria.mari@upm.es	Th - 17:00 - 19:00 Ask for an specific date by email
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* The tutoring schedule is indicative and subject to possible changes. Please check tutoring times with the faculty member in charge.

2.3. External faculty

Name and surname	Email	Institution
Paloma Lozano Picazo	paloma.lozano@upm.es	Centro de Tecnología Biomédica
Mónica Echeverry	monica.echeverry@imdea.org	Imdea Materiales

3. Skills and learning outcomes *

3.1. Skills to be learned

CB06 - Poseer y comprender conocimientos que aporten una base u oportunidad de ser originales en el desarrollo y/o aplicación de ideas, a menudo en un contexto de investigación

CB07 - Que los estudiantes sepan aplicar los conocimientos adquiridos y su capacidad de resolución de problemas en entornos nuevos o poco conocidos dentro de contextos más amplios (o multidisciplinares) relacionados con su área de estudio

CB08 - Que los estudiantes sean capaces de integrar conocimientos y enfrentarse a la complejidad de formular juicios a partir de una información que, siendo incompleta o limitada, incluya reflexiones sobre las responsabilidades sociales y éticas vinculadas a la aplicación de sus conocimientos y juicios

CB09 - Que los estudiantes sepan comunicar sus conclusiones y los conocimientos y razones últimas que las sustentan a públicos especializados y no especializados de un modo claro y sin ambigüedades

CB10 - Que los estudiantes posean las habilidades de aprendizaje que les permitan continuar estudiando de un modo que habrá de ser en gran medida autodirigido o autónomo.

CG-MIB02 - Analizar y aplicar la reglamentación correspondiente a la sensibilidad social y ética en los ámbitos de operación que pueden darse en Ingeniería Biomédica

CG-MIB04 - Utilizar las tecnologías de la información y la comunicación para la búsqueda de información, datos bibliográficos y adquisición de nuevo conocimiento para la formación permanente y el trabajo autónomo

CG-MIB05 - Utilizar técnicas de expresión oral y escrita para comunicar trabajos y conclusiones a comunidades de iguales o divulgación científica, elaboración de artículos, manuales de estilo y herramientas de edición para fomentar la capacidad de comunicación y disseminación de resultados

CG-MIB07 - Utilizar la lengua inglesa como herramienta de trabajo

3.2. Learning outcomes

RA106 - RA38-EN Knowing and understanding the basic approaches of tissue engineering and their biomechanical aspects

RA11 - Presentar el proyecto de forma escrita, oral y pública

RA109 - To develop teamwork capabilities in the pursuit of completing an assignment, from the planning and documentation phase to the presentation of results

RA103 - RA36-EN Analysis and selection of biomaterials and biological materials for medical devices

RA104 - RA37-EN Analysis, modeling and selection of metals, ceramics and polymers for bioengineering design tasks

RA112 - To develop the ability for oral communication of results

* The Learning Guides should reflect the Skills and Learning Outcomes in the same way as indicated in the Degree Verification Memory. For this reason, they have not been translated into English and appear in Spanish.

4. Brief description of the subject and syllabus

4.1. Brief description of the subject

Regenerative medicine involves the repair and regeneration of tissues for therapeutic purposes.

Regenerative medicine tries to mimic the natural processes in tissue development and the intrinsic healing mechanisms of the bodies.

In this course the students will learn about regenerative medicine and tissue engineering from basics to more sophisticated applications.

The students will be given a basic introduction on stem cells and how they differentiate. Also, they will explore biomaterials and their role in tissue engineering and regenerative medicine, providing a deep knowledge in the cell-biomaterial interaction. The students will also study the mechanisms and limitations underlying cell therapies with mesenchymal stem cells and immunomodulatory therapies. It will be provided an overview on bioreactors for cell productions and different tissue engineering strategies. Later, the lectures will be focused on specific applications in tissue engineering and cell therapy, provided by professionals working in the field.

4.2. Syllabus

1. Introduction to Regenerative Medicine.
2. Cell types. Differentiation. Development.
3. Basics of cell culture
4. Cell-biomaterial interactions I
5. Cell-biomaterial interactions II
6. Scaffolds. Functionalization
7. Cell therapy: mesenchymal stem cells and CART cells
8. Bioreactors
9. Other tissue engineering strategies
10. Applications in regenerative medicine: stents / tissue engineered blood vessels
11. Applications in regenerative medicine: professional seminars

5. Schedule

5.1. Subject schedule*

Week	Classroom activities	Laboratory activities	Distant / On-line	Assessment activities
1	Introduction to Regenerative Medicine Duration: 02:00 Lecture			
2	Cell types. Differentiation. Development Duration: 02:00 Lecture			
3	Basics of cell culture Duration: 02:00 Lecture			
4	Interaction Cell-Biomaterial I Duration: 02:00 Lecture			
5	Interaction Cell-Biomaterial II Duration: 02:00 Lecture			
6	Scaffolds. Functionalization Duration: 01:00 Lecture		Journal club Duration: 01:00 Additional activities	
7	Cell therapy: mesenchymal stem cells and CART cells Duration: 02:00 Lecture			
8	Bioreactors Duration: 02:00 Lecture			
9	Other tissue engineering strategies Duration: 02:00 Lecture			
10	Applications in regenerative medicine: stents / tissue engineered blood vessels Duration: 02:00 Lecture			
11	Applications in regenerative medicine: professional seminar Duration: 02:00 Lecture			
12	Applications in regenerative medicine: professional seminar Duration: 02:00 Lecture			

13	Applications in regenerative medicine: professional seminar Duration: 02:00 Lecture			
14	Applications in regenerative medicine: professional seminar Duration: 02:00 Lecture			
15				Group presentations Group presentation Continuous assessment Presential Duration: 02:00
16				Exam Written test Continuous assessment Presential Duration: 02:00
17				Final exam Written test Final examination Not Presential Duration: 02:00

Depending on the programme study plan, total values will be calculated according to the ECTS credit unit as 26/27 hours of student face-to-face contact and independent study time.

* The schedule is based on an a priori planning of the subject; it might be modified during the academic year, especially considering the COVID19 evolution.

6. Activities and assessment criteria

6.1. Assessment activities

6.1.1. Assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
15	Group presentations	Group presentation	Face-to-face	02:00	40%	4 / 10	CB06 CB07 CB08 CB09 CB10 CG-MIB02 CG-MIB04 CG-MIB05 CG-MIB07
16	Exam	Written test	Face-to-face	02:00	60%	4 / 10	

6.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
17	Final exam	Written test	No Presential	02:00	100%	5 / 10	CB06 CB07 CB08 CB09 CB10 CG-MIB02 CG-MIB04 CG-MIB05 CG-MIB07

6.1.3. Referred (re-sit) examination

No se ha definido la evaluación extraordinaria.

6.2. Assessment criteria

Ordinary evaluation

The evaluation of students will be based on 2 main points:

- An oral presentation of a particular topic of the subject (40% weight)

PASS MARK ≥ 4

- A final written exam (60% weight)

PASS MARK ≥ 4

Extraordinary evaluation

Only final exam with a total weight of 100%.

Pass mark: EX ≥ 5

For ordinary and extraordinary evaluation, a minimum score of 5 is required.

7. Teaching resources

7.1. Teaching resources for the subject

Name	Type	Notes
Lecciones de Materiales Biológicos y Biomateriales	Bibliography	J. Pérez-Rigueiro. Ingebook Libros electrónicos (2007).
Molecular Biology of the Cell	Bibliography	Alberts B, Johnson A, Lewis J, et al. New York: Garland Science; 2002.
Principles of Regenerative Medicine	Bibliography	Atala A, Lanza R, Thomson J. A. and Nerem R. M. Boston: Elsevier; 2011.
Biomedical Engineering. Bridging Medicine and Technology	Bibliography	Saltzman W. M. Cambridge University Press; 2009.

8. Other information

8.1. Other information about the subject

In a normal situation the Evaluation Activities and classes will be done presentially.

In case the Chief of Studies says so, all the activities will be done telematically with no significant changes either in the contents or in the schedule.