

Course guide

820036 - TEB - Tissue Engineering

Last modified: 14/06/2023

Unit in charge: Barcelona East School of Engineering
Teaching unit: 702 - CEM - Department of Materials Science and Engineering.

Degree: BACHELOR'S DEGREE IN BIOMEDICAL ENGINEERING (Syllabus 2009). (Optional subject).

Academic year: 2023 **ECTS Credits:** 6.0 **Languages:** English

LECTURER

Coordinating lecturer: ELISABET ENGEL LOPEZ

Others: Primer quadrimestre:
SOLEDAD GRACIELA PEREZ AMODIO - T11

PRIOR SKILLS

The students should have taken at least a basic Biology course and Human Physiology course.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Transversal:

1. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 3. Communicating clearly and efficiently in oral and written presentations. Adapting to audiences and communication aims by using suitable strategies and means.
2. EFFECTIVE USE OF INFORMATION RESOURCES - Level 3. Planning and using the information necessary for an academic assignment (a final thesis, for example) based on a critical appraisal of the information resources used.

TEACHING METHODOLOGY

This subject uses the expositive methodology (theory) in a 30%, self study and work as well as group work (guided activities) in a 22% in class , self study and work as well as group work (non presential) in a 45%.
The professor will provide the students with the necessary bibliografy as well as scientific papers to be used to work at home and in class.

LEARNING OBJECTIVES OF THE SUBJECT

The general objective is to treat the different issues that play a role in tissue engineering from a high interdisciplinary view. It is the aim that students can understand the need of controlling all factors related to biomaterials architecture.cell biology, biochemistry pathways, surface characterization and modification and the effect of different stimuli (physicals and chemicals), to be able to grow tissues through the discipline known as tissue engineering.

STUDY LOAD

Type	Hours	Percentage
Hours small group	8,0	5.33
Self study	90,0	60.00
Hours large group	52,0	34.67

Total learning time: 150 h



CONTENTS

(ENG) · Theme 1. Introduction.

Description:

What is tissue engineering?. Bases: Materials, cells and stimuli.

Specific objectives:

To understand the globality of this discipline and the interrelations among the different features.

Related activities:

Activity 1. Strategies in tissue engineering.

Full-or-part-time: 13h

Theory classes: 4h

Laboratory classes: 2h

Self study : 7h

(ENG) -- Theme 2. The cells.

Description:

Adult stem cells and embrionic stem cells. (SC=Stem Cells).Pros and cons. Needs of culture conditions. Exemples and applications. Regulations and ethical reflexions.

Specific objectives:

To get knowledge in which cell types are available to be used in tissue engineering applications.

Related activities:

Activity 2. Questions on stem cells.

Full-or-part-time: 17h

Theory classes: 7h

Self study : 10h

(ENG) -- Theme 3. Nanotechnology applied to tissue engineering.

Description:

Conference about nanotechnology tools to be used in tissue engineering.

Related activities:

Activity 3. Questions about the conference.

Full-or-part-time: 6h

Theory classes: 2h

Self study : 4h



(ENG) · Theme 4. Cells and materials interactions.

Description:

Adhesive and non adhesive biomaterials. The extracellular matrix. Relevance. Estrategies.

Specific objectives:

To understand the relevance of the extracellular matrix and its interaction with materials.

Related activities:

Activity 4. Search for a scientific paper to illustrate each of the strategies.

Full-or-part-time: 14h

Theory classes: 6h

Self study : 8h

(ENG) Theme 5. Biochemical stimuli.

Description:

Growth factors and cytokines.

Specific objectives:

Get to know the type of factors and their effects.

Full-or-part-time: 9h

Theory classes: 4h

Self study : 5h

(ENG) -- Theme 6. Surfaces: Properties, modification and characterization.

Description:

Properties, modification and characterization.

Specific objectives:

Get to know the surface properties of biomaterials and the characterization methods.

Get to know the type and methodologies of surface modifications to apply them to different applications.

Related activities:

Activity 5. Group activity that will present a paper given in class.

Full-or-part-time: 18h

Theory classes: 7h

Self study : 11h

(ENG) -- Theme 7. Regenerative medicine vs bionics. Materials and devices.

Description:

Materials and devices.

Specific objectives:

Get to know the different applications for tissue engineering and bionics.

Full-or-part-time: 11h

Theory classes: 6h

Self study : 5h



(ENG) -- Theme 8. Products: from the bench to the market. Conference.

Description:

Conference.

Specific objectives:

To understand the difficulties to go from basic research to commercialization of biomedical devices.

Related activities:

Activity 6. Debate.

Full-or-part-time: 14h

Theory classes: 4h

Self study : 10h

(ENG) - Theme 9. Angiogenesis and vascularization.

Full-or-part-time: 4h

Theory classes: 2h

Self study : 2h

(ENG) -Theme 10. Effect of mechanical stimuli. Mecanotransduction.

Full-or-part-time: 9h

Theory classes: 4h

Self study : 5h

(ENG) -- Theme 11. Applications in tissue engineering and regenerative medicine. Final course work to prepared by the students.

Description:

Final work of the course.

Specific objectives:

Assolir la matèria donada durant el curs a partir de la búsqueda d'una aplicació concreta.

Related activities:

Activity7. Students will prepare, in groups, a presentation getting together all what has been treated in the course and focus it in an specific application in tissue engineering.

Full-or-part-time: 31h

Theory classes: 6h

Self study : 25h

(ENG) - How to prepare a presentation?

Full-or-part-time: 2h

Theory classes: 2h



(ENG) - How to search and select information?

Full-or-part-time: 2h

Theory classes: 2h

GRADING SYSTEM

The evaluation will be by means of continuous evaluation.

Mid Term Exam 1 (Npp1) = 35%

Mid Term Exam 2 (Npp2) = 35%

Autonomous learning (Nap) = 30%. (5% of Transversal competence included)

Transversal competencies: EFFICIENT ORAL AND WRITTEN COMMUNICATION and EFFECTIVE USE OF INFORMATION RESOURCES: 5%

There will be re-evaluation if the student has presented to the final exam.

BIBLIOGRAPHY

Basic:

- Ayala, A.; Lanza, R. Methods of tissue engineering. San Diego [etc.]: Academic Press, cop. 2002. ISBN 0124366368.
- Principles of tissue engineering [on line]. 3rd ed. San Diego (Calif.)[etc.]: Academic Press, 2007 [Consultation: 17/06/2020]. Available on: <http://www.sciencedirect.com/science/book/9780123706157>. ISBN 9780123706157.
- Frontiers in tissue engineering. Oxford [etc.]: Pergamon, 1998. ISBN 0080426891.