Course guide
820022 - BMTB - Biomaterials

Last modified: 04/06/2026

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). (Compulsory subject).

Academic year: 2026 **ECTS Credits:** 6.0 **Languages:** Catalan

LECTURER

Coordinating lecturer: DANIEL RODRÍGUEZ RIUS

Others: Segon quadrimestre:
JUDIT BUXADERA PALOMERO - Grup: M11, Grup: M12, Grup: M15
MONTSERRAT ESPAÑOL PONS - Grup: M13, Grup: M14
DANIEL RODRÍGUEZ RIUS - Grup: M11, Grup: M12, Grup: M13, Grup: M14, Grup: M15

REQUIREMENTS

BIOMECÀNICA - Prerequisit

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CEBIO-34. Discern the fundamental criteria that a material must meet before it can be implanted.

CEBIO-250. Identify the fundamental concepts and application principles of biomaterials and apply them to biomedical engineering problems.

Transversal:
1. SELF-DIRECTED LEARNING - Level 3. Applying the knowledge gained in completing a task according to its relevance and importance. Deciding how to carry out a task, the amount of time to be devoted to it and the most suitable information sources.

TEACHING METHODOLOGY

The methods employed are:
- 30% presential lessons
- 5% directed presential work (problems)
- 10% laboratory sessions
- 55% self-study

An important component of learning is based on the realization of Lab projects in groups during the course. It includes the preparation and implementation of mechanical testing of biomaterials, programming and processing of the acquired data. It is an activity initially guided, but later the student must develop it independently, based on the knowledge acquired in the course.

LEARNING OBJECTIVES OF THE SUBJECT

Upon completion of the course, the student shall be able to:
- understand the basic requirements of a biomaterial and the basic tests for its characterization.
- understand the fundamental basis and concepts of biomaterial application within biomedical engineering.
- be able to perform experimental testing on biomaterials.

STUDY LOAD

Type	Hours	Percentage
Self study	90,0	60.00
Hours small group	15,0	10.00
Hours large group	45,0	30.00

Total learning time: 150 h

CONTENTS

Definition, classification and properties of biomaterials

Description:
Presentation of the characteristics of biomaterials: what is a biomaterial, how is it classified and what are their most important properties. Description of the main techniques used for biomaterial characterization.

Specific objectives:
Definition of Biomaterials.
Classification of biomaterials.
Properties of Biomaterials.

Related activities:
Lab practice: activity 1.
Lab practice: activity 2.

Related competencies :
07 AAT N3. SELF-DIRECTED LEARNING - Level 3. Applying the knowledge gained in completing a task according to its relevance and importance. Deciding how to carry out a task, the amount of time to be devoted to it and the most suitable information sources.

Full-or-part-time: 50h
Theory classes: 17h
Laboratory classes: 4h
Self study : 29h

Biomaterials' behaviour in biological systems

Description:
Study the response of biomaterials implanted in a biological environment, the interaction with tissues and the mechanisms of degradation of implanted biomaterials.

Specific objectives:
Properties of materials.
Surface characterization of materials.
Biomaterial-tissue interaction.
Degradation of biomaterials in service.

Related activities:
Lab practice: activity 3.

Full-or-part-time: 20h
Theory classes: 7h
Laboratory classes: 2h
Self study : 11h

Definition and evaluation of biocompatibility

Description:
Definition of biocompatibility and description of the techniques used for its evaluation.

Specific objectives:
Definition of Biocompatibility.
Evaluation of Biocompatibility.

Related activities:
Lab practice: activity 4.

Full-or-part-time: 14h
Theory classes: 4h
Laboratory classes: 2h
Self study : 8h

Use of biomaterials in biomedical applications

Description:
A description of the main applications of biomaterials as components to implant in the human body.

Specific objectives:
Biomaterials for hard tissue.
Biomaterials for soft tissue.
Biomaterials in contact with the cardiovascular system.

Related activities:
Lab practice: activity 5.
Lab practice: activity 6.

Full-or-part-time: 35h
Theory classes: 12h
Laboratory classes: 4h
Self study : 19h

New trends in biomaterials

Description:
Description of the recent trends in biomaterials research, their aims and future developments.

Specific objectives:
Recent trends in biomaterials development.

Related activities:
Lab practice: activity 7.
Lab practice: activity 8.

Related competencies :
07 AAT N3. SELF-DIRECTED LEARNING - Level 3. Applying the knowledge gained in completing a task according to its relevance and importance. Deciding how to carry out a task, the amount of time to be devoted to it and the most suitable information sources.

Full-or-part-time: 29h
Theory classes: 9h
Self study : 20h

GRADING SYSTEM

Any academic fraud, plagiarism or use or possession of unauthorised means in an assessment activity leads to a mark of zero (0) for the affected test or assignment. Furthermore, in accordance with the University's regulations, if disciplinary proceedings are initiated the subject is recorded as "Pending Assessment" until a decision is reached. These incidents are managed in accordance with the **Action Framework for Academic Integrity in Assessment at the UPC**.

Partial controls (2): 35%
Final control: 40%
Lab practicum and reports: 25%
Attendance to Lab sessions and seminars is mandatory to pass this subject.
This subject does not include a reevaluation test.

EXAMINATION RULES.

The use of devices with communication capabilities is not allowed.

BIBLIOGRAPHY

Basic:
- Park, Joon Bu; Lakes, Roderic S. Biomaterials : an introduction. 3rd ed. New York: Springer, cop. 2007. ISBN 9780387378794.
- Ratner, Buddy. Biomaterials science : an introduction to materials in medicine. 2nd ed. San Diego: Elsevier Academic, cop. 2004. ISBN 0125824637.

Complementary:
- Black, Jonathan. Biological perfomance of materials : fundamentals of biocompatibility. 4th ed. Boca Raton [etc.]: CRC / Taylor & Francis, 2006. ISBN 0849339596.
- Proubasta, I.; Planell, J. A.; Gil, F. X.. Fundamentos de biomecánica y biomateriales. Madrid: Ergon, DL 1997. ISBN 848983413X.