820023 - BMB - Biomechanics

Coordinating unit: 295 - EEBE - Barcelona East School of Engineering
Teaching unit: 702 - CMEM - Department of Materials Science and Metallurgy
Academic year: 2019
Degree: BACHELOR'S DEGREE IN BIOMEDICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN BIOMEDICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
ECTS credits: 6 Teaching languages: Catalan

Teaching staff

Coordinator: DANIEL RODRÍGUEZ RIUS
Others: Primer quadrimestre:
JORDI LLUMA FUENTES - M11, M12, M13, M14
DANIEL RODRÍGUEZ RIUS - M11, M12, M13, M14

Opening hours

Timetable: Published in Atenea.

Requirements

SISTEMES MECÀNICS - Prerequisite

Degree competences to which the subject contributes

Specific:
CEBIO-260. Analyse and reduce the loads applied to a biomechanical system. Assess the kinematic behaviour and strength of a joint and the strength behaviour of human tissue.

Transversal:
5. SELF-DIRECTED LEARNING - Level 2: Completing set tasks based on the guidelines set by lecturers. Devoting the time needed to complete each task, including personal contributions and expanding on the recommended information sources.
6. TEAMWORK - Level 2. Contributing to the consolidation of a team by planning targets and working efficiently to favor communication, task assignment and cohesion.
7. EFFECTIVE USE OF INFORMATION RESOURCES - Level 2. Designing and executing a good strategy for advanced searches using specialized information resources, once the various parts of an academic document have been identified and bibliographical references provided. Choosing suitable information based on its relevance and quality.

Teaching methodology

There are 15 master sessions. Each one is dedicated to one of the content blocks. In the lectures the student adopts a receptive role.
Lab practices and problems will be conducted in seminar sessions. Problems are individual and practices are made in teams.

Learning objectives of the subject

1. Acquire the basic concepts and knowledge of biomechanics.
2. To know the structure, function and movement of the human body and the various joints.
3. To know the kinematic behavior of human joints and tissues.
4. To know the bioinstrumentation used for the analysis of biomechanics.

<table>
<thead>
<tr>
<th>Study load</th>
<th>Total learning time: 150h</th>
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</thead>
<tbody>
<tr>
<td>Hours large group:</td>
<td>37h 30m</td>
</tr>
<tr>
<td>Hours medium group:</td>
<td>0h</td>
</tr>
<tr>
<td>Hours small group:</td>
<td>22h 30m</td>
</tr>
<tr>
<td>Guided activities:</td>
<td>0h</td>
</tr>
<tr>
<td>Self study:</td>
<td>90h</td>
</tr>
<tr>
<td></td>
<td>25.00%</td>
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<td>60.00%</td>
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### Introduction

**Description:**
Introduction to the subject.

**Specific objectives:**
Learn the key elements that make up the knowledge of mechanical physics.

**Learning time:** 3h

- Theory classes: 1h
- Laboratory classes: 0h 30m
- Self study: 1h 30m

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### Fundamentals of biomechanics

**Description:**
- Kinematics.
- Kinetics.
- Control of the movement.
- Joint stability.

**Related activities:**
- Lab practice.
- Experimental work.
- Problems.

**Specific objectives:**
Learn the basics and dynamic mechanical analysis and its application to the human body movement and the measurement tools.

**Learning time:** 15h

- Theory classes: 6h
- Self study: 9h
### Tissue biomechanics of the musculoskeletal system

**Learning time:** 22h  
Theory classes: 8h 30m  
Self study: 13h 30m

**Description:**  
Bone biomechanics  
Biomechanics of cartilage  
Biomechanics of tendon and ligament  
Biomechanics of muscle  
Biomechanics of nervous tissue  
Biomechanics of blood

**Related activities:**  
Lab practice and experimental work.

**Specific objectives:**  
Learn the key elements that make up the basics of biomechanics of tissues and be able to apply the methods to the study of musculoskeletal biomechanics.

### Joint biomechanics

**Learning time:** 32h 30m  
Theory classes: 7h  
Laboratory classes: 6h  
Self study: 19h 30m

**Description:**  
Biomechanics of the hip  
Biomechanics of the knee  
Ankle Biomechanics  
Foot Biomechanics  
Shoulder Biomechanics  
Biomechanics of the elbow  
Biomechanics of the wrist

**Related activities:**  
Lab practices  
Problems  
Experimental work

**Specific objectives:**  
Learn the key elements that make up the basics of biomechanics of the joint structures and be able to apply the methods to the study of musculoskeletal biomechanics.
### Biomechanics of the spine

<table>
<thead>
<tr>
<th>Learning time: 12h 30m</th>
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<tbody>
<tr>
<td>Theory classes: 3h</td>
</tr>
<tr>
<td>Laboratory classes: 2h</td>
</tr>
<tr>
<td>Self study : 7h 30m</td>
</tr>
</tbody>
</table>

**Description:**
Biomechanics of the spine

**Related activities:**
Lab practices  
Problems  
Experimental work

**Specific objectives:**
Learn the key elements that make up the basics of biomechanics of the spine and be able to apply the methods of biomechanics to study the locomotor system.

### Human gait

<table>
<thead>
<tr>
<th>Learning time: 10h</th>
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<tbody>
<tr>
<td>Theory classes: 4h</td>
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<tr>
<td>Self study : 6h</td>
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**Description:**
Normal human gait

**Related activities:**
Lab practices  
Experimental work

**Specific objectives:**
To learn the cycle of normal human gait and to determine, based on the same patterns, the role of each of the joints and tissues.
### Applied biomechanics

<table>
<thead>
<tr>
<th>Learning time: 55h</th>
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<tr>
<td>Theory classes: 8h</td>
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<tr>
<td>Laboratory classes: 14h</td>
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<tr>
<td>Self study: 33h</td>
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### Description:
- Pathological human gait
- Analysis of forces and pressures. Parameters of human gait
- Motion analysis system. Parameters of human gait
- Electromyography. Parameters of human gait

### Related activities:
- Lab practices.

### Specific objectives:
To learn about the instruments and biomechanical analysis of human gait and analyze their results.

### Qualification system

The grade is based on:
- Participation in seminars: 10%
- Evaluation of practices and problems: 40%
- Partial test: 15%
- Final test: 35%

This subject does not include a reevaluation test.

### Regulations for carrying out activities

Attendance at practices and seminars is mandatory.
The use of devices with communication capabilities is not allowed.

### Bibliography

**Basic:**

**Complementary:**