Course guide
240324 - 240NR028 - Rehabilitation Equipment

Unit in charge: Barcelona School of Industrial Engineering
Teaching unit: 712 - EM - Department of Mechanical Engineering.
Degree: MASTER'S DEGREE IN NEUROENGINEERING AND REHABILITATION (Syllabus 2020). (Compulsory subject).
Academic year: 2022 ECTS Credits: 3.0 Languages: Catalan, Spanish, English

LECTURER
Coordinating lecturer: Ramos Castro, Juan Jose
Others: Miquel A. Mañanas
Rocío Sánchez Carrión Abascal
Itziar de Lecuona Ramírez
Xavier Canals
Claire Murphy

TEACHING METHODOLOGY
The course will have a theoretical approach with some practice sessions at the end of the semester. The theory sessions will explain concepts and perform exercises at the end of each session. Some of the sessions will include experts who will explain the state of the art. In laboratory sessions, students will use control and modeling software for respiratory rehabilitation systems.

LEARNING OBJECTIVES OF THE SUBJECT
The aim of the course is to introduce students to the applications of rehabilitation equipment for patients with neurological, cardiac and respiratory injuries as well as the bioethical and regulatory aspects of the use of these systems in clinical practice.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours small group</td>
<td>6,0</td>
<td>8.00</td>
</tr>
<tr>
<td>Self study</td>
<td>48,0</td>
<td>64.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>21,0</td>
<td>28.00</td>
</tr>
</tbody>
</table>

Total learning time: 75 h
## Neurocognitive Rehabilitation Systems

**Description:**
- Neuropsychological disorders in patients with acquired brain damage
- Approaches to neuropsychological rehabilitation
- Innovation and clinical research in neuropsychology
- New technologies in neuropsychological rehabilitation

**Related activities:**
- Theory lesson
- Case studies

**Full-or-part-time:** 16h
- Theory classes: 6h
- Guided activities: 2h
- Self study: 8h

## Bioethics

**Description:**
- Ethical, legal and social aspects
- International and European legal frameworks
- Ethical and legal aspects of personal data protection (GDPR)
- Responsible research and innovation

**Full-or-part-time:** 11h
- Theory classes: 4h
- Self study: 7h

## CE marking (MDR) and risk analysis

**Description:**
- Introduction. Health technology requirements
- EU requirements: CE MDR marking
- US Requirements: CDRH-FDA
- ISO 14971 Risk Management
- Recommendations. Colloquium

**Full-or-part-time:** 11h
- Theory classes: 4h
- Self study: 7h
Cardiac rehabilitation, respiratory therapy and mechanical ventilation

Description:
- Rehabilitació Cardíaca: Incidència de CVD, Exercici i Activitat Física, Definició de Rehabilitació Cardíaca, Implementació de CR
- Sistema de control respiratori
- Rehabilitació pulmonar
- Equips de teràpia de rehabilitació
- Ventilació total: no invasiva
- Ventilació mecànica
  - Conceptes bàsics
  - Com funcionen els ventiladors
  - Sistema de control
  - Modes de ventilació

**Full-or-part-time:** 32h
- Theory classes: 8h
- Practical classes: 4h
- Self study: 20h

**GRADING SYSTEM**

Throughout the course there will be 4 tests at the end of each topic and a theoretical + practical work in the respiratory rehabilitation session. The AC continuous assessment grade will be calculated as:
\[
AC = 0.15 (NT1 + NT2 + NT3 + NT4) + 0.35 \text{TTP}
\]
At the end of the course there will be a final exam with an EF grade.
The grade of the subject will be calculated as: \(\max (EF, 0.5 \cdot EF + 0.5 \cdot AC)\)

**EXAMINATION RULES.**

The practices and the presentation of the theory work will be done in groups of two people. The exam will be individual.