

Academic Year: ( 2024 / 2025 )

Review date: 26-04-2024

Department assigned to the subject: Bioengineering Department

Coordinating teacher: RUBIO ALONSO, HIGINIO

Type: Compulsory ECTS Credits : 9.0

Year : 1 Semester : 2

## REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

It is recommended to have passed the following subjects of the first quarter of the first year:

- Medical imaging technologies
- Physiological systems
- Electronic circuits and optics for clinical engineering
- Electrotechnical systems for clinical engineering
- Mechanical systems for clinical engineering

## OBJECTIVES

This subject provides students with the correct knowledge about the classification of electromedical systems, specifically those that have analytical and monitoring function, according to their technical specifications and features. The student will know the necessary details for a correct interpretation of the technical sheets for both installation and maintenance and verification of the equipment. With the support of this documentation, the student will obtain the necessary knowledge for the reception, assembly and disassembly, commissioning, diagnosis and repair of failures, maintenance and functional verification of the analysis and monitoring systems and their associated infrastructures, in concordance with the current regulations.

## COMPETENCES THAT THE STUDENT ACQUIRES WITH THIS MATTER

CB6. To acquire comprehensive knowledge providing the opportunity to be creative in the development and/or application of ideas.

CB7. To be able to apply the acquired knowledge and their problem solving skills to the resolution of problems in novel or relatively unfamiliar environments within broader (or multidisciplinary) contexts related to their area of study.

CB8. To be able to integrate knowledge and face the complexity of judgement making based on information that, being incomplete or limited, includes reflections on social and ethical responsibilities linked to the application of their knowledge and judgments.

CB9. To demonstrate an ability to communicate their conclusions, their knowledge and the ultimate reasons that sustain them to specialized and non-specialized audiences in a clear and unambiguous way.

CB10. To possess the learning abilities that allow autonomous long-life learning.

CG1. To possess the ability to learn new methods and technologies, from the mastery of scientific subjects and specialized techniques of Clinical Engineering, as well as the ability to adapt to new situations.

CG2. To develop the ability to apply knowledge about the human being and the life sciences to the resolution of problems typical of Clinical Engineering. In particular, the ability to identify medical problems that can be treated using the techniques encompassed in Clinical Engineering.

CG3. To develop the ability to design and carry out technological projects in the field of the application of engineering to medicine, as well as the ability to analyze and interpret the obtained results.

CG4. To develop the ability to evaluate medical equipment and instrumentation in complex multidisciplinary environments, assessing

CE1. Ability to evaluate algorithms and data processing techniques in complex multidisciplinary environments, assessing the needs of different clinical users and offering objective measures for

decision making.

CE2. Ability to understand and use advanced statistical methods for conducting scientific studies, evaluation of equipment from the point of view of effectiveness, accreditation for medical use or study of comparative effects in patients.

CE3. Ability to apply advanced techniques of health technology management, both in technical and economic aspects, and including the acquisition and maintenance thereof.

CE10. Ability to install and maintain non-implantable active medical devices, in electromedicine systems and their associated facilities, under quality criteria, in safety conditions and in compliance with current regulations.

## LEARNING RESULTS

- Classify, categorize and explain the principles features and functions of electromedical equipment.
- Characterize the equipment, identifying its functionality and technical specifications.
- Decide correctly the equipment and the appropriate imaging technique depending on clinical needs.
- Know how to choose the appropriate electromedical equipment taking into account the specific needs, technical requirements and safety standards of a specific clinical application.
- Diagnose failures or dysfunctions in infrastructures, systems and equipment, identifying the type of cause of the incident and the possibility of resolution.
- Repair breakdowns in infrastructures, systems and equipment, applying specific techniques and procedures and checking the return of operation.
- Recognize, define and describe sensors with biomedical applications and know how to measure variables

## DESCRIPTION OF CONTENTS: PROGRAMME

This subject is key of the study of the electromedical equipment of a health center from the point of view of their installation and maintenance.

The subject content is:

- General concepts of analytical and monitoring equipment.
- Analysis of the characteristics and technical and operational requirements of the principal analytical and monitoring equipment.

## LEARNING ACTIVITIES AND METHODOLOGY

The teaching methodology will be mainly based on theoretical classes, theoretical-practical classes, seminars and practical sessions.

Due to the large number of topics covered and their multidisciplinary nature, it is very convenient for the student to read the documentation assigned before the classes and when needed, supplement it with additional information obtained through their personal work.

### LEARNING ACTIVITIES:

- Theoretical classes
- Theoretical-practical class
- Practical seminars
- Tutorials
- Individual and team work

### TEACHING METHODOLOGIES:

- Exhibitions in the teacher's class with support of computer and audiovisual media, in which the main concepts of the subject are developed and the bibliography is provided to complement the students' learning.
- Resolution of practical cases, problems, etc. raised by the teacher individually or in groups.
- Exhibition and discussion in class, under the teacher's moderation of topics related to the content of the subject, as well as practical cases.
- Preparation of papers and reports individually or in groups.

## ASSESSMENT SYSTEM

<b>% end-of-term-examination:</b>	40
<b>% of continuous assessment (assignments, laboratory, practicals...):</b>	60

#### ORDINARY CALL:

Continuous assessment: 60%

- The continuous evaluation will represent 60% of the final score.
- It will consist of carrying out individual assignments, problems and / or practical activities.
- Participation in class and Aula Global will be taken into account: includes participation during seminars, in the Aula Global forum, attitude in class, exercises in class (to be solved in groups or individually), or other activities.

Final exam: 40%

- The final exam will cover the entire syllabus and will represent 40% of the final score. The minimum score in the final exam to pass the course is 5.0 out of 10.0, regardless of the grade obtained in the continuous assessment.

#### EXTRAORDINARY CALL:

- The final grade for students who attend the extraordinary call may be:
  - (1) 40% of the extraordinary exam and 60% of the continuous evaluation, obtained during the ordinary call.
  - (2) 100% of the extraordinary exam.

#### BASIC BIBLIOGRAPHY

- UNE 20611:1979 Aspectos básicos del concepto de seguridad del equipo eléctrico utilizado en la práctica médica., , 2012
- UNE-EN 60601-1:2008/A11:2012 Equipos electromédicos. Parte 1: Requisitos generales para la seguridad básica y funcionamiento esencial., , 2012

#### ADDITIONAL BIBLIOGRAPHY

- EN ISO 80601-2-12 Equipos electromédicos. Parte 2-12, , 2011
- EN ISO 80601-2-61 Equipos electromédicos. Parte 2-61, , 2011
- UNE-EN 285:2007+A2:2009 Esterilización., , 2009
- UNE-EN 60601-1/A1:1996 Equipos electromédicos. Requisitos generales para la seguridad, , 1996
- UNE-EN 60601-2-12:2007 Equipos electromédicos. Parte 2-12, , 2007
- UNE-EN 60601-2-19:2010 Equipos electromédicos. Parte 2-19, , 2010
- UNE-EN 60601-2-20:2010 Equipos electromédicos. Parte 2-20, , 2010
- UNE-EN 60601-2-20:2010/A11:2012 Equipos electromédicos. Parte 2-20, , 2012
- UNE-EN 60601-2-21 Equipos electromédicos. Parte 2-21, , .
- UNE-EN 60601-2-21:2010/A11:2012 Equipos electromédicos. Parte 2-21, , 2012
- UNE-EN 60601-2-24:1999 Equipos electromédicos. Parte 2, , 1999

- UNE-EN 60601-2-25/A1:2000 Equipos electromédicos. Parte 2-25, ., 2000
- UNE-EN 60601-2-25:1997 Equipos electromédicos. Parte 2, ., 1997
- UNE-EN 60601-2-26:2004 Equipos electromédicos. Parte 2-51, ., 2004
- UNE-EN 60601-2-2:2010 Equipos electromédicos. Parte 2-2, ., 2010
- UNE-EN 60601-2-34:2001 Equipos electromédicos. Parte 2-34, ., 2001
- UNE-EN 60601-2-41:2010 Equipos electromédicos. Parte 2-41, ., 2010
- UNE-EN 60601-2-41:2010/A11:2012 Equipos electromédicos. Parte 2-41, ., 2012
- UNE-EN 60601-2-50:2010 Equipos electromédicos. Parte 2-50, ., 2010
- UNE-EN 60601-2-50:2010/A11:2012 Equipos electromédicos. Parte 2-50: , ., 2012
- UNE-EN 61010-2-040:2006 Requisitos de seguridad de equipos eléctricos de medida, control y uso en laboratorio. Parte 2-040, ., 2006
- UNE-EN 794-3:1999+A2:2010 Respiradores pulmonares. Parte 3, ., 2010
- UNE-EN ISO 15883-4:2009 Lavadoras desinfectadoras. Parte 4, ., 2009