Analytical and monitoring systems

Academic Year: (2019 / 2020) **Review date: 07-05-2020**

Department assigned to the subject: Bioengineering and Aeroespace Engineering Department

Coordinating teacher: ABELLA GARCIA, MONICA

Type: Compulsory ECTS Credits : 9.0

Year : 1 Semester : 2

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

It is recommended to have passed all the subjects of the Module: Technologies for Clinical Engineering of the first semester of the first year.

OBJECTIVES

COMEPETENCES AND SKILLS THAT WILL BE ACQUIRED

Basic or general competences:

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 responsabilities 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

Specific competences:

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

To pass this subject the students should be able to:

- Classify, categorize and explain the operating principles of electromedical equipment.
- Recognize, define and describe the sensor with biomedical applications and know how to perform measurements of physiological variables in both the clinical and the biomedical environment.
- Know how to choose the appropriate electromedical equipment with respect to the needs, technical requirements, standards and safety of a specific clinical application.
- Define the tasks of the clinical engineer in the hospital environment.
- Characterize the facilities, systems and equipment, being able to identify their functionality and their technical characteristics.
- Receive the equipment and elements of the system to be installed, verifying that they are those indicated in the established assembly plan.
- Verify the physical space and the infrastructure where the assembly of the installation, system or equipment will be performed, interpreting and applying the procedures established in the assembly plan.
- Set up, prior to its clinical use, facilities, systems and equipment, applying the maintenance plan of the health center, the manufacturer recommendations and the current regulation.
- Diagnose faults or malfunctions in facilities, systems and equipment, identifying the cause of the incidence and the possibility of resolution by our own or other means.
- Repair faults in facilities, systems and equipment, applying specific techniques and procedures and verifying the restoration of operation.

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. Specifically, the program is structured as follows:

PART 1.-GENERAL CONCEPTS

- Previous considerations. Spatial risk areas.
- Measures of biopotentials
- Classification of analytical and monitoring equipment
- Verification of spaces and facilities
- Diagnosis and faults repair
- Maintenance and functional verification

PART 2. SPECIFIC EQUIPMENT

- Neurology and neurophysiology equipment
- Respirators and mechanical ventilators
- Anesthesia and resuscitation
- Ophthalmology equipment
- Autoclaves and sterilization equipment
- Multi-channel monitor
- Defibrillator
- Incubator
- Other 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.

The used teaching methodologies will be:

-Oral exposition of the professor in class with support of computer and audiovisual media, in which the main concepts of the subject are developed. Bibliography will be provided to complement the students¿ learning process.
-Critical reading of texts recommended by the teacher: Reports, manuals and/or academic articles, either for discussion in class, or to expand and consolidate the knowledge of the subject.
-Resolution of practical cases or problems chosen by the professor, individually or in teams.
-Preparation of related work and reports, individually or in teams.

Development and justification:

-Theoretical academic sessions: As a means of offering a general and systematic overview of the topics, highlighting the most important aspects and combining exercises within the theoretical explanations as needed.
-Theoretical-practical sessions: The theoretical information about a given equipment will be mixed with practical exercises performed on-site on the given equipment.
-Practical sessions: They will consist on visits to Hospitals with the aim of making the students aware of aspects relevant to the Analytical and Monitorization Systems used in the institution. To consolidate the learnt concepts, the students will prepare a short report on the visit.
-Seminars: Presentation and discussion of the proposed work, structured as seminars, in which the team work and oral skills and the defense of their own opinion and the ability to discuss about a topic or work are practiced.

Tutorials and support classes will be held before the final exam. Tutoring sessions and their schedule will be published in Aula Global.

ASSESSMENT SYSTEM

The mark will be based in a continuous evaluation and the result of the final exam that will cover all the material. In particular, it will be valued:

SE1. Participation in class.

SE2. Individual or team work carried out during the course.

SE3. Final exam.

CONTINUOUS EVALUATION:

The evaluation of the acquired knowledge and competences will be carried out through the realization of exercises, practices and works related to the thematic blocks described above. It would also be included the contribution to seminars and the forum in Aula Global. The student attitude and the participation in other activities proposed by the teachers will also be taken into account in this continuous evaluation block. The evaluation process is based on the student¿s personal work.

The tutorized works will have a weight of 50% in the final assessment of the subject. The active participation in the theoretical and practical classes will have a weight of 10%.

FINAL EXAM:

A theoretical-practical exam will be performed. It will consist on the interpretation of a series of theoretical questions and the resolution of a certain number of problems. This exam will have a weight of 40% in the final assessment of the subject. The relative weight of each part will be indicated in the test statement. The minimum score in the final exam to pass the subject is 4.0 over 10.0, notwithstanding the mark obtained in the continuous evaluation.

EXTRAORDINARY EXAMS:

The mark for the students attending any extraordinary examination will be the maximum between:

a) 100% of the extraordinary exam mark, or
b) 40% of the extraordinary exam mark and 60% of the continuous evaluation, if it is available in the same course.

ACADEMIC CONDUCT:

All exams will be closed-book, closed-notes, no PC or mobile phone, or anything else other than a pen and the exam itself. Plagiarism, cheating or other acts of academic dishonesty will be not tolerated. Any infractions whatsoever will result in a failing grade.

% end-of-term-examination:	40
% of continuous assessment (assigments, laboratory, practicals…):	60

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, ., .
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- UNE-EN 60601-2-25:1997 Equipos electromédicos. Parte 2, ., 1997
- UNE-EN 60601-2-26:2004 Equipos electromédicos. Parte 2-51, ., 2004
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- UNE-EN 60601-2-34:2001 Equipos electromédicos. Parte 2-34, ., 2001
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- 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