Course guide
820024 - ECB - Clinical Engineering

Last modified: 04/06/2026

Unit in charge: Barcelona East School of Engineering
Teaching unit: 707 - ESAII - Department of Automatic Control.

Degree: BACHELOR'S DEGREE IN BIOMEDICAL ENGINEERING (Syllabus 2009). (Compulsory subject).

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

LECTURER

Coordinating lecturer: BEATRIZ FABIOLA GIRALDO GIRALDO

Others: Segon quadrimestre:
MARÍA DOLORES BLANCO ALMAZÁN - Grup: M11, Grup: M12
BEATRIZ FABIOLA GIRALDO GIRALDO - Grup: M11, Grup: M12
MANUEL LOZANO GARCÍA - Grup: M11, Grup: M12
SUSANA ADRIANA VELAZQUEZ LERMA - Grup: M11, Grup: M12

REQUIREMENTS

SEGURETAT HOSPITALÀRIA - Irequisit

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. Run and plan clinical engineering services in healthcare centres.
CEBIO-28. Organise and carry out the maintenance of equipment and systems related to biomedical engineering.
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Transversal:
2. 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 methodologies used are (approximately): participative lectures by 20%, self-learning (problems and practices in classroom) by 30%, homework by 20%, teamwork by 25%, and evaluation activities by 5%. Also, uses techniques of cooperative learning and project based learning.

LEARNING OBJECTIVES OF THE SUBJECT

At the end of the course the student will be able to
1. Describing the fundamental concepts related to management of medical technologies and structure of hospital facilities.
2. Identifying different types of processes of a health-center: clinical, technical-assistance, catering, and of support.
3. Knowing different aspects of regulation and legislation related to hospital facilities.
4. Acquiring basic skills in the planning, design and supervision of a hospital setting.
5. Identifying and describing issues related to ethical topics, safe environment, and sustainable in hospitals.

STUDY LOAD

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

Total learning time: 150 h

CONTENTS

Unit 1. Hospital setting.

Description:
The structure of the hospital. Functional areas of general services. Care units and support units. Clinical architecture. General and specific rules related to: facilities, security, maintenance, etc.

Specific objectives:
At the end of this subject the student will be able to:
- Explaining the general structure of a hospital.
- Identifying the different functional areas of general services in hospitals.
- Identifying and defining health care units and support units of the hospitals.
- Identifying the fundamental topics to the clinical architecture.
- Identifying and interpreting the general and specific rules related to:
facilities, security, maintenance, etc.

Related activities:
Classroom lessons about hospital setting.
Finding information - generic description of a hospital setting - in person and out-of-class.
Visit to a hospital environment.

Full-or-part-time: 15h
Theory classes: 3h
Laboratory classes: 1h
Self study : 11h

Unit 2. Acquisition and management of hospital equipment.

Description:
Planning of new acquisitions and needs study. Management of equipment procurement: specifications, tender conditions, contract. Receipt, inspection and installation of new equipment. Documentation, organization and methods of use. Training of hospital staff.

Specific objectives:
At the end of this subject the student will be able to:
- Manage the procurement of equipment: technical specifications, tender, contract documents.
- Manage the receipt, inspection and installation of new equipment.
- Schedule training in the use of new equipment for hospital staff.

Related activities:
Classroom lessons.
Finding information - acquisition and management of hospital equipment - in person and out-of-class.

Full-or-part-time: 30h
Theory classes: 8h
Laboratory classes: 2h
Self study : 20h

Unit 3. Hospital facilities and special facilities.

Description:
Electrical and sanitary facilities. Facilities of special protection: special protection areas, white and dirty areas. Air Conditioning. Medical gases. Firefighting equipment.
Communications: telephone, TV, public-address system. Inter and intra hospital communications: hospital information flow, wireless, etc.. Other specific types of facilities in hospitals.

Specific objectives:
At the end of this subject the student will be able to:
- Identifying aspects related to installations as: electrical, sanitary, medical gases, fire.
- Identifying aspects related to the special protections facilities.
- Identifying aspects related to air conditioning systems.
- Identifying aspects related to inter and intra hospital communications: flow hospital data, wireless, etc.

Related activities:
Classroom lessons.
Finding information - hospital installations - in person and out-of-class.
Visit to a hospital environment.

Full-or-part-time: 30h
Theory classes: 10h
Laboratory classes: 3h
Self study : 17h

Unit 4. Hospital services.

Description:
Units of: nursing, intensive care, emergency, hospitalization. day hospital. Maternal and newborn service. Surgical units. Diagnostic image units. Laboratories. Catering service. Administration and hospital management.

Specific objectives:
At the end of this subject the student will be able to:
- Identifying and differentiate hospital services of nursing, intensive care units, emergency.
- Identifying and differentiate hospital services of hospitalization, day hospital and ambulatory; maternity and newborn service.
- Identifying and differentiate surgical units, recovery rooms, diagnostic image units, labs.
- Identifying aspects related to the administration and hospital management.

Related activities:
Classroom lessons.
Homework - proposal a project related to hospital services.
Visit to a hospital environment.

Full-or-part-time: 30h
Theory classes: 8h
Laboratory classes: 2h
Self study : 20h

Unit 5. Hospital maintenance.

Description:
General maintenance: basic functions. Types of maintenance: preventive, corrective, on-demand, periodic reviews, etc. Documentation. Maintenance indicators. Recruitment process.

Specific objectives:
At the end of this subject the student will be able to:
- Describing basics concepts related to the hospital maintenance.
- Differentiating and applying different types of maintenance: preventive, corrective, periodic reviews, etc..
- Designing documentation for the control and monitoring of maintenance at the hospital.
- Identifying and monitoring maintenance indicators.
- Planning and manage maintenance contracts both general and specific.

Related activities:
Classroom lessons.
Homework - part of the project related to a hospital maintenance.
Visit to maintenance service of a hospital.

Full-or-part-time: 30h
Theory classes: 10h
Laboratory classes: 3h
Self study : 17h

Unit 6. Environmental management and sustainability in hospitals.

Description:
Ethical issues in the development of the profession. Sustainability. Biosafety. Environmental management. Renewable energy

Specific objectives:
At the end of this subject the student will be able to:
- Exhibiting the ethical issues related to the development of the profession.
- Identifying sustainability issues in the hospital setting.
- Identifying aspects of biosafety.
- Identifying areas of possible application of renewable energies.
- Implementing actions in accordance with appropriate environmental management and sustainable.

Related activities:
Classroom lessons.
Homework - finding information and development of part of the project related to environment.
Visit to a hospital.

Full-or-part-time: 15h
Theory classes: 5h
Laboratory classes: 1h
Self study : 9h

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**.

Last control: 20%
Practices: 10%
Seminars: 5%
Supervised activity: 40%
Project definition: 5%
Joint project: 20%
One third of the grade of the project corresponds to the final presentation at the end of the course, another third corresponds to the proceeding paper, and the final third corresponds to documentation of the project.

It is mandatory to carry out the practices to pass the subject

In this subject will schedule a reassessment.
The students will be able to access the re-assessment test that meets the requirements set by the EEBE in its Assessment and Permanence Regulations (https://eebe.upc.edu/ca/estudis/normatives-academiques/documents/eebe-normativa-avaluacio-i-permanencia-18-19-aprovat-je-2018-06-13.pdf)

EXAMINATION RULES.

The written test will be developed within the class time.
Practical tests - visits to hospitals - will be evaluated with a each one report.
The supervised activity will be evaluated according to the different tasks developed during the course.

The project will be common to all three subjects: ECB, EMCTB i SHB. Whenever possible, it should contain topics related to each subjects. The evaluation shall be joint, and based on the oral presentation and documentation.

BIBLIOGRAPHY

Basic:
- Apunts de l' assignatura.
- Jacobson, Bertil; Webster, John G. Medicine and clinical engineering. Englewood Cliffs (New Jersey): Prentice-Hall, 1977.
- INSHT. Instituto Nacional de Seguridad e Higiene en el Trabajo [on line]. Madrid: INSHT, 2020 [Consultation: 25/07/2011]. Available on: https://www.insst.es/.
- Legislación Española : reglamentación y normativa vigentes.

Complementary:
- Brown, B. H. [et al.]. Medical physics and biomedical engineering. Bristol: Institute of Physics, 1999. ISBN 0750303689.
- Cook, Albert M.; Webster, John G. Therapeutic medical devices : application and design. Englewood Cliffs, N.J: Prentice-Hall, cop. 1982. ISBN 0139147969.
- Reglamentación y normativa específicas.
- Cromwell, Leslie; Weibell, Fred J.; Pfeiffer, Erich A. Biomedical instrumentation and measurements. 2nd ed. Englewood Cliffs (New Jersey): Prentice-Hall, cop. 1980. ISBN 0130764485.