

**COURSE DATA****DATA SUBJECT****Code:** 44768**Name:** Medical instrumentation**Cycle:** Master's Degree**ECTS Credits:** 4.5**Academic year:** 2025-26**STUDY (S)**

Degree	Center	Acad. year	Period
2231 - Master's Degree in Biomedical Engineering	Facultat de Medicina i Odontologia	1	First quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
2231 - Master's Degree in Biomedical Engineering	Bridging courses	ELECTIVES

COORDINATION

CALPE MARAVILLA JAVIER

SUMMARY

This module on Medical Instrumentation is devoted to acquire knowledge on biomedical instrumentation and to introduce the student to the design and use of medical instrumentation and equipment and show the state of the art of the field. The module includes 35 lecturing hours plus some lab exercises and the execution of a team project supervised by the instructors. Main topics to be covered are norms and legislation, monitoring systems, measurements in the cardiovascular and respiratory systems, clinical laboratory instrumentation, electric stimulation, and surgery and therapeutic instrumentation.

PREVIOUS KNOWLEDGE**RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE**

There are no specified enrollment restrictions with other subjects of the curriculum.

OTHER REQUIREMENTS

Not applicable. However, some basic knowledge in electronics and signal processing is advisable



COMPETENCES / LEARNING OUTCOMES

DESCRIPTION OF CONTENTS

1. MEDICAL INSTRUMENTATION SYSTEMS

Introduction and general structure
Design criteria
General specifications of instrumentation systems
The health care industry State of the art
Patents

2. NORMS

Review of applicable normative
Electromagnetic compatibility (EMC)
Design techniques for EMC

3. INSTRUMENTATION SYSTEMS

Sensors
Noise. Origin, coupling and mitigation
Instrumentation amplifiers
Conditioning circuits and analog preprocessing of signals

4. MONITORING SYSTEMS

Electrocardiograph.
Vetocardiograph
High resolution electrocardiography
Cardiotachometer
Cardiac monitor
Holter Systems
Electroencephalography
Polysomnography equipment
Evoked potentials equipment
Electromyography

Direct and indirect pressure measurements
Arterial blood pressure monitors



5. MEASUREMENTS IN THE CARDIOVASCULAR SYSTEM

Direct and indirect pressure measurements
Cardiac sounds. Phonocardiography
Electromagnetic and ultrasound flux monitors
Plethysmography

6. MEASUREMENTS OF THE RESPIRATORY SYSTEM

Pressure and flux measurement for the respiratory system
Lung volume: Spirometry. Respiratory plethysmography
Ventilation and ventilators
Gas concentration measurement
Assisted ventilation systems

7. INSTRUMENTATION FOR A CLINICAL LABORATORY

Spectrophotometry
Automatic chemical analysis
Chromatography

8. SURGERY AND THERAPEUTIC SYSTEMS

Surgery instrumentation: ESU and laser
Pediatric incubators
Laser therapeutic applications

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	35,00
Classroom practices	10,00
Total hours	45,00

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	30,00
Individual or group project	20,00
Independent study and work	40,00
Preparation of lessons	30,00
Preparation for assessment activities	10,00



Resolution of case studies	0,00
Total hours	130,00

TEACHING METHODOLOGY

The theoretical part of the course arises in the form of master class. Those lectures will be supported by audiovisual media. Prior to the class, students will have all the material that will be in that class.

There will be a laboratory session involving the use of a data acquisition system and the processing of a biological signal

One or more works will be required. These will be done in groups of 2 or 3. A memory of each work will be submitted and will be exposed in a joint session, where they will be discussed by all the students.

The lecturers will inform students about their tutoring schedule. This schedule shall be as broad as possible so that students may make use of them.

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EVALUATION

A 50% of the final mark will be obtained from the evaluation of Works and/or lab/practical sessions. A 50% of the final mark will be obtained from a final written exam.

A minimum mark of 4/10 is required in each part.

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REFERENCES

- Referencia b1: Principles of Bioinstrumentation. R.A. Norman. Ed. Wiley, 1988 Referencia b2: Medical Instrumentation. Application and Design. J. Webster. Ed. Wiley, 1997 Referencia b3: The Biomedical Engineering Handbook. J. Bronzino. CRC Press, 2000 Referencia b4: Principles of Applied Biomedical Instrumentation. L.A. Geddes; L.E. Baker. Wiley 1989