

DIM-SAP-434 Bio-Measurements

SEMESTER: Spring
CREDITS: 3 ECTS (2 hrs. per week)
LANGUAGE: English
DEGREES: SAPIENS Program

Course overview

This course is an introduction to measurement technologies in Health and Biology. It gives an overview on uncertainty calculations and focus development of precise measurement procedures with different instrumentation actually used in Health Science.

Prerequisites

Basic knowledge of statistics and excel.

Course contents

Theory (4 hours/2 sessions):

- 1.- Principles of Metrology. International System of Units. Definition of the fundamental Units. Royal Decrees [Regulations published by Executive Order]. Standardized notation. Main metrological vocabulary and concepts (VIM).
- 2.- Basics of Metrology. Direct and Indirect Measurements. Measurement with basic systems. Metrological characteristics for instruments.
- 3.- Scientific metrology in Health Science. Traceability concepts, calibration and industrial verification fundamentals. National Measurement Institutes and Health Institutions. Calibration in Bio-Measurement.
- 4.- Legal Health Metrology. Definitions and concepts. OIML recommendations. Notified institutions. Bio and Health Metrological institutions.
- 5.- Bio-Measurement variability. Control process uncertainty budget. Error causes in measurement. Uncertainty concept. Type A and B uncertainty contributions. Measurement corrections. GUM uncertainty budget.
- 6.- Quality assesment in a Health laboratory (ISO 17025). Organization of a dimensional metrology laboratory. Intercomparisons and result traceability. Standardization, certification and accreditation on Dimensional Metrology Laboratories. International and national committees. Metrological reality for Spain and other countries.

Laboratory (22 hours/11 sessions):

There will be four 2-hour sessions.

Measurement, development of measurement procedures, calibration of different instruments.

BioMechanical Metrology (6 hours/3 sessions):

- P1.** Length measurement: Calipers, micrometers, goniometers, mechanical comparators.
- P2.** Mechanical measurement (vibration measurement, flow measurement, weight measurement, long distances measurement with distanciometers)
- P3.** Visit Length/Mass Metrology Lab CEM

Low Voltage Electronic Measurement in Health (6 hours/3 sessions):

- P4.** Low voltage measurement: oscilloscopes, voltmeters, amperimeters ... and its application to Vital constant Monitors, electrocardiogram
- P5.** Light measurement, Laser metrology, length measurement with distancimeter ... and its application to Radiodiagnosis measurements.
- P6.** Visit Electrical Metrology Lab CEM

Health Measurement (10 hours/5 sessions):

- P7.** Measurement of human movements with kinovea
- P8.** Gait analysis with photogrammetry.
- P9.** Visit Health Metrology Lab CEM
- P10.** Visit Health Metrology Lab School Ciempozuelos
- P11.** Visit Health Metrology Lab School Ciempozuelos

Presentation (4 hours/2 sessions):

Development of a measurement procedure related with a technology of interest and its live presentation.

Textbook

- VIM and GUM

Grading

The following conditions must be accomplished to pass the course:

- A minimum overall grade of at least 5 over 10.

The overall grade is obtained as follows:

- Test on theory 10%.
- Laboratory 77% (11% each session)
- Live presentation 13%.