



UNIVERSITÀ  
DEGLI STUDI DI MILANO-BICOCCA

## SYLLABUS DEL CORSO

### Physical Sensors and Systems for Biomedical Signals

2324-2-F9102Q018

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#### Aims

The main objective of the course is to provide the student with the basic knowledge in physical sensors and techniques involved in the acquisition, elaboration and interpretation of biomedical signals. A special focus on scintillation detectors and silicon photomultipliers for the sensors side and magnetic, optical, electronic, probe scanning techniques for the physical systems part will be provided.

#### Contents

The physical principles at the basis of the acquisition of different biomedical signals will be presented. The signals obtained by means of physical sensors and systems properly developed for biomedical applications will be described together with a series of practical examples.

#### Detailed program

- Fundamental principles and instrumentation of Nuclear Magnetic Resonance.
- NMR spectroscopy and relaxometry (in vitro and in vivo).
- Nanomagnetism: Magnetic biosensors and their biomedical applications; Magnetic Particle imaging (MPI).
- Functional near-infrared spectroscopy.
- Electron (Scanning Electron Microscope, Transmission Electron Microscope) and Scanning Probe Microscopy (Atomic Force Microscope, Scanning Tunnelling Microscope).
- Use of the Silicon PhotoMultipliers (SiPM) and scintillating crystals in the detection of gamma rays in the PET.
- X-ray detection (crystals+SiPM or direct SiPM).

## **Prerequisites**

Fundamentals in classical electromagnetism, quantum mechanics, nuclear and particle physics.

## **Teaching form**

Lectures and laboratory activity.

Both of them will be held in presence and attendance is warmly recommended.

## **Textbook and teaching resource**

Notes, software, data and scientific articles provided to students during the course.

## **Semester**

First semester.

## **Assessment method**

The evaluation of the student's performance is based on:  
oral examination spanning all the topics covered in the course.

## **Office hours**

## **Sustainable Development Goals**

GOOD HEALTH AND WELL-BEING

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