UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Biophotonics Laboratory

2425-1-F1701Q120

Aims

To learn to exploit advanced spectroscopic techniques to characterize nanomaterials, biomolecules and biological samples.

Contents

Time-resolved spectroscopic techniques applied to biosystems. Fluorescence lifetimes of typical fluorophores used in optical microscopy. Fluorescence anisotropy. Polarized and depolarized dynamic light scattering. Fluorescence correlation spectroscopy.

Detailed program

Fluorescence lifetimes measurements of typical fluorophores used in optical microscopy. Dyes in solution and mixtures of dyes. Fluorophore-protein binding constant evaluation from lifetimes measurements. Proteins size and aggregation studies by means of fluorescence polarization anisotropy. Polarized and depolarized dynamic light scattering. Temperature and salt concentration effects on protein diffusion dynamics. Aggregation kinetics. Fluorescence correlation spectroscopy (FCS): calibration of the optical setup, experiments versus excitation power and concentration. Green Fluorescent Protein photophysics. Gold nanoparticles FCS. Molecular crowding experiments.

Prerequisites

The topics covered in the different courses of the Bachelor Degree in Physics.

Recommended: the Biophotonics course of the Master Degree in Physics and/or the Experiments of Biophotonics course of the Bachelor Degree in Physics.

Teaching form

Approximately eight hours of initial instructional teaching, followed by interactive laboratory teaching, with practical training activities conducted in person in the research laboratories of the Biophysics group, rooms 4054-4052-4051.

Textbook and teaching resource

C.R.Cantor and P.R.Schimmel, “Biophysical Chemistry”, W.H. Freeman & Co, 1980;

J.R.Lackowicz, “Principles of Fluorescence Spectroscopy”, Springer, 2006;

A.Diaspro, “Confocal and two photon microscopy: foundations, applications and advances” edited by Alberto Diaspro, Wiley, 2002.

Semester

I semester.

Assessment method

Students are required to write a report in English describing the experiments performed and it will be the focus of the final oral examination.
Each student will also have to prepare a short presentation (10 min) on one of the experiments carried out during the course.

The final grade will be determined by the evaluation of the report, of the knowledge of the different topics covered in the lab, of the experimental data analysis and of the student’s behavior throughout the course in the laboratory.

Office hours

By appointment.

Sustainable Development Goals

GOOD HEALTH AND WELL-BEING | QUALITY EDUCATION | DECENT WORK AND ECONOMIC GROWTH | INDUSTRY, INNOVATION AND INFRASTRUCTURE