

Laboratorio di Fisica dell'Interazione Radiazione-Materia

*The course will provide technical information and experimental details on the measurement of the optical response functions presented in light-matter interaction models. In this respect, the course is grounded on the material specific of other courses, such as *Struttura della Materia* and *Strutturistica Chimica*. It will also complement the theoretical models introduced in *Fisica dello Stato Solido* and *Fisica dei Laser*. Finally, it covers some of the linear spectroscopies left over by the course *Ottica Moderna*.*

The course is heavily "hands-on" oriented, with few pre-prepared training laboratory experiments and one "big project" to be personally developed by students in collaboration with the tutors.

- Light-Matter Interaction (LMI) in the 0.1 – 10 eV energy range

definition of terms and conditions – basic optical components: what they do, how to choose, how much they cost – basic optical systems: light sources and their characteristics, beam shaping in space time amplitude and phase, light selectors and light detectors – LMI with atoms: linewidth and lifetime measurement, photoacoustic and modulation spectroscopies, laser-induced fluorescence – LMI with soft matter: microscopies, light scattering and optical tweezers – LMI with solid materials: absorption related spectroscopies, luminescence from free and bound states, time resolved techniques

- Laboratory practice

transmission, reflectance, luminescence – characterization of light sources, optical components and optical instruments – do it your own: laser, spatial-light modulator, optical tweezer, optical coherent tomograph, polarimeter and ellipsometer

- Reference textbooks:

B.E.A. Saleh and M.C. Teich, *Fundamentals of Photonics (II ed)*, Wiley 2007
W. Demtroder, *Laser Spectroscopy (IV ed)*, Springer 2008