UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Laboratory of Solid State and Quantum Technologies II

2122-1-F1701Q147

Aims

Development of experimental skills related to solid state physics and quantum technologies using advanced laboratory techniques based mainly on spectroscopy and electron spin resonance.

Contents

Implementation of an experiment based on quantum technologies and condensed matter physics that complement the activities conducted in the lab of the first semester.

Detailed program

The course consists of an experiment performed by students divided into groups of three or four people.

The lab activities will follow introductory lessons on the correlation between physical properties of the solids, quantization effects and the associated experimental techniques. Besides the design of the experiment, students will conduct the characterization of the system under examination, complementing the activities with data analysis and a written report.

Examples of lab activities:

Quantum confined Stark effect and study of quantum emitters.

Raman spectroscopy of two-dimensional quantum materials.

Electron spin spectroscopy in semiconducting nanostructures.

Electron transport in quantum dots.

Prerequisites

Bachelor in physics or equivalent and the first semester lab course.

Teaching form

Practical lab sessions.

Textbook and teaching resource

References (available also as e-book through the University’s library):

Lecture notes provided by the instructor

J. H. Davies "The Physics of Low-dimensional Semiconductors", Cambridge University Press

F. Fox "Optical Properties of Solids", Oxford University Press

I. Pelant and J. Valenta " Luminescence Spectroscopy of Semiconductors", Oxford University Press

Abragam, A. & Bleaney, B. “Electron paramagnetic resonance of transition ions”. Oxford University Press (1970).

Eaton G.R., Eaton S.S., Barr D.B. and Weber R.T. “Quantitative EPR”. Springer-Verlag/Wien (2010)

Thomas Ihn Electronic “Quantum Transport in Mesoscopic Semiconductor Structures” Springer Verlag New York (2004)

Semester

Second semester

Assessment method

The assessment method consists of a project work written by the group and its discussion in a final oral exam to evaluate the knowledge and the communication skills in the disciplinary field.

Tests will not be conducted in itinere.

The final mark is also based on the skill showed in the development of the lab experiment.

Office hours

A help desk will be provided to the students upon direct request via email to the instructor. All the information related to the contacts and office address can be found at the university website.