UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Solid State Physics Laboratory

2021-3-E3001Q064

Aims

The aim of the course is to present some characterization techniques for solid state physics. Particular attention is paid to semiconductors.

Contents

The course is composed by laboratory experiences addressed to the electrical and optical characterization of semiconductor (conductivity and Hall effect, p-n junction characterization, absorption and photovoltaic conversion of the light).

Frontal lessons will precede the laboratory activity.

Detailed program

The part of theoretical introduction concerns the following topics:
•DEFINITION
• CRYSTALLINE STRUCTURE
• BAND STRUCTURE
• INTRINSIC AND EXTRASIVE CARRIERS
•TRANSPORT
• HALL EFFECT
• JUNCTION p-n
• OPTICAL ABSORPTION
• PHOTOVOLTAIC CELL

During the laboratory different experiences are carried out regarding some properties of semiconductors or devices, measuring some fundamental quantities such as resistivity, mobility, life time, absorption or conversion efficiency of solar cells. An experience concerns the deposition of thin films.

Prerequisites

Physics courses and physics laboratories of the previous years.

Teaching form

During the Covid-19 emergency period, lessons will take place in a mixed mode: partial attendance and asynchronous / synchronous videotaped lessons.

n ° 2 credits for lectures (8 hours / cfu) during the lectures the main topics of solid state physics are introduced in order to allow a complete understanding of the experiences carried out in the laboratory

n ° 4 cfu laboratory activities (16 hours / cfu)

Students are divided into groups of 4-5 students. Groups are generally 5 or 6 in such a way that they can rotate all 6 already prepared experiences. If necessary, 1-2 new experiences can be added.

The currently active experiences are:

Hall effect in semiconductors

Solar power response in power

Spectral response to solar cells

Determination of life time in silicon

Transmittance measurements and semiconductor reflectance

Deposition of thin films by evaporation

Textbook and teaching resource

Photocopies of the theoretical description and performance of the experiences provided by the teacher

Books suggested:

C. Kittel:

“**Introduzione alla Fisica dello Stato Solido**”

Bollati Boringhieri

Mario Guzzi:

“**Principi di fisica dei semiconduttori**”

Editore Ulrico Hoepli (Milano, 2004)

Semester

Second semester

Assessment method

The evaluation of the students' knowledge will be based on a written assessment consisting of 9 questions on the introductory part to the experiences explained in the introductory lectures At the end of the experiences the students must deliver a written report on all the experiences carried out. It is requested that the report is not particularly extensive (max 6 pages per experience). In the oral exam the completed homework, the delivered reports and in-depth information about any inaccuracies in the written parts are discussed.

Office hours

On Tuesday at 2 pm by appointment