UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Principles of electron microscopy and applications to nanomaterials research

2526-116R-M08

Title

Principles of Electron Microscopy and Applications to Nanomaterials Research

Teacher(s)

Prof. Giovanni Maria Vanacore

Language

English

Short description

The course aims at providing an introduction to the main techniques of electron microscopy with applications to materials.

The following topics will be discussed:

- Introduction to electron optics: wave-nature of electrons; electron-matter interaction; basic layout of a

microscope.

- Transmission Electron Microscopy (TEM): imaging modes (bright and dark field), diffraction and crystallography; amplitude and phase contrasts in TEM; advanced modes of operation: High- Resolution TEM, magnetic TEM, and Scanning TEM.
- Scanning Electron Microscopy (SEM): layout of a SEM microscope; secondary electron contrast and imaging modes.
- Electron Spectroscopies in TEM/SEM: Electron Energy-Loss Spectroscopy (EELS); Energy Dispersive X-Ray Spectroscopy (EDS); Chathodoluminescence (CL); Auger Electron Spectroscopy (AES).
- TEM/SEM investigation of nanomaterials for electronic, photonic and phononic applications.

CFU / Hours

1 CFU/ 8 hours

Teaching period

March 2026

Sustainable Development Goals

QUALITY EDUCATION | INDUSTRY, INNOVATION AND INFRASTRUCTURE