UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

SYLLABUS DEL CORSO

Scanning Microscopy and Spectroscopy: Principles, Applications, Image Handling

2526-1-124R007

Title

Scanning microscopy and spectroscopy: principles, applications, image handling

Teacher

Marcello Campione, Valerio Cerantola

Language

English

Short description

The course provides basic principles of scanning probe microscopy (SPM), synchrotron-based spectroscopy and diffraction, and methods in nanoscience. Topics include nano-probe/surface interactions, signal monitoring, image reproduction, and artifact recognition. Case studies cover functional nanostructures, nanotribology, and mineral surface physics. Practical sessions use freeware software for image handling. Fundamentals of synchrotron radiation and techniques (X-ray absorption spectroscopy and X-ray diffraction) are also introduced.

Lecture I: Basic concepts of nano-probe/surface interaction
Lecture II: Signal monitoring in SPM techniques and image reproduction
Lecture III: Case studies in nanosciences: functional nanostructures, nanotribology, and mineral surface physics
Lecture IV - V: Image handling: practical session with freeware software.
Lecture VI: Fundamentals of synchrotron radiation
Lecture VII: Introduction to synchrotron radiation: analytical techniques
Lecture VIII: Rietveld refinement of synchrotron-based XRD pattern – Part 1
Lecture IX: Rietveld refinement of synchrotron-based XRD pattern – Part 2
Lecture X: Data handling of synchrotron-based spectroscopy techniques: X-ray Emission and Mössbauer spectroscopy

Expected outcomes: understanding SPM applications in cross-disciplinary fields, interpreting and handling false-colour SPM images, XAS 2D mapping for local structure and valence state analysis, and XRD mapping for phase and structural identification.

Suggested years of attendance: I and II

Final evaluation: The final assessment consists of a multiple choice test to be taken online.

Target audience

Maximum number of participans

Assessment method

The final assessment consists of a multiple choice test to be taken online.

CFU / Hours

2 CFU - 20 Hours (8h lecture - 12h computer practical sessions)

Teaching period and mode

I semester

Sustainable Development Goals