



UNIVERSITÀ
degli STUDI
di CATANIA



DIPARTIMENTO DI FISICA E ASTRONOMIA
“ETTORE MAJORANA”

DOTTORATO DI RICERCA IN FISICA-CICLO XLI
ANNO ACCADEMICO 2025/2026

Scanning Probe Microscopies

2 CFU

Teaching staff

Francesco Ruffino

Email: francesco.ruffino@ct.infn.it

Office: 244, Department of Physics and Astronomy

Telephone: +393785466

Reception hours: Monday 15:00-17:00, Wednesday 15:00-17:00

Program of the course:

- 1) Scanning Probe Microscopies: the local probe approach, basic principles, operation modes, experimental set-up, design and instrumentations, historical overview and role in nanotechnology
- 2) Scanning Probe Microscopies typologies: scanning tunneling microscopy, atomic force microscopy, conductive atomic force microscopy, magnetic force microscopy, Kelvin probe microscopy.
- 3) Images acquisition and analysis with scanning probe microscopies: images acquisition, images manipulation, artifacts, images analysis.
- 4) Applications of scanning probe microscopies to the analysis of nanostructured metallic, insulating,

semiconducting surfaces.

5) Nanofabrication using scanning probe microscopy: atomic scale manipulation of matter, local anodic oxidation, nanolithography.

Bibliography:

1. K. S. Birdi, "Scanning Probe Microscopies: Applications in Science and Technology", CRC Press, 2003.
 2. E. Meyer, H. Hug, R. Bennewitz, "Scanning Probe Microscopy: the Lab on a Tip", Springer-Verlag, 2003.
 3. R. Wiesendanger, "Scanning Probe Microscopy and Spectroscopy: Methods and Applications", Cambridge University Press, 1995.
 4. D. Sarid, "Scanning Force Microscopy: with Applications to Electric, Magnetic, and Atomic Forces", Oxford University Press, 1994.
-