Subject: Scanning probe microscopes and nanomanipulation

Semester: Fall
ECTS Credits: 2.5
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OBJECTIVES
This course’s objective is to provide the student with a description of scanning probe microscopies (atomic force microscopy, scanning tunnelling microscopy and near-field scanning optical microscopy) and their usage in characterization and manipulation of surfaces at a nanometric scale.

PROGRAM
I. INTRODUCTION TO SCANNING PROBE MICROSCOPES

II. SCANNING TUNNELING MICROSCOPY (STM)

III. ATOMIC FORCE MICROSCOPY (AFM)
Atomic forces. Atomic force microscope. Principal techniques for image recollection: contact, dynamic, non-contact. AFM images interpretation: Topographic images, deflexion images, friction images, phase images, etc. Artefacts and resolution limits. Characterization techniques using AFM: Electrostatic and magnetic forces, surface potential, electric conductivity, electric capacity, etc. Principal spectroscopic characterization techniques: forces spectroscopy, current-tension spectroscopy.

III. SCANNING NEARFIELD OPTICAL MICROSCOPY (SNOM)

IV. NANOMANIPULATION


PRACTIC CONTENTS

1. Demonstration of how a tunnelling effect microscope works.
2. Introduction to atomic force microscope use.
3. Demonstration of how a near-field optical microscope works.
4. Nanomanipulation experiment using atomic force microscopes

EVALUATION METHOD

Written exam (50%) and informs on the practical experiences (50%).

BIBLIOGRAPHY

- [http://www.physikinstrumente.com/](http://www.physikinstrumente.com/)