# Microscopy training program
# ScopeM

***Course Title:***
Scanning Electron Microscopy I – Introduction to SEM

***Abstract:***
This introductory course on Scanning Electron Microscopy (SEM) emphasizes hands-on learning. Using 2 SEM instruments, students have the opportunity to study their own samples, or standard test samples, as well as solving exercises provided by ScopeM scientists.
During the course, students learn through lectures, demonstrations, and hands-on sessions how to setup and operate SEM instruments, including low-vacuum and low-voltage applications.
This course gives basic skills for students new to SEM. At the end of the course, students with no prior experience are able to align a SEM, to obtain secondary electron (SE) and backscatter electron (BSE) micrographs and to perform EDX qualitative and semi-quantitative analysis. The procedures to better utilize SEM to solve practical problems and to optimize SEM analysis for a wide range of materials will be emphasized.
Passing a short test at the end of the course is expected for the successful completion of the course.

***Objective:***
- Set-up, align and operate a SEM successfully and safely
- Accomplish imaging tasks successfully and optimize microscope performances
- Master the operation of a low-vacuum and field-emission SEM and EDX instrument
- Perform sample preparation with corresponding techniques and equipment for imaging and analysis
- Acquire techniques in obtaining secondary electron and backscatter electron micrographs
- Perform EDX qualitative and semi-quantitative analysis

***Content:***
1. Discussion of student's sample/interest
2. Introduction and discussion on Electron Microscopy and instrumentation
3. Lectures on Electron Sources, Electron Lenses and Probe Formation
4. Lectures on beam/specimen interaction, image formation, image contrast and imaging modes.
5. Lectures on sample preparation techniques for EM
6. Brief description and demonstration of the SEM microscope
7. Practice on beam/specimen interaction, image formation, image contrast (and image processing)
8. Student participation on sample preparation techniques
9. Scanning Electron Microscopy lab exercises: setup and operate the instrument under various imaging modalities

10. Lecture and demonstrations on X-ray micro-analysis (theory and detection), qualitative and semi-quantitative EDX and point analysis, linescans and spectral mapping
11. Practice on real-world samples and report results

**Number of participants:**

The course is limited to 6 participants.

**Course duration:**

5 days, from 9am to 5 pm.

**Course fee:**

400 CHF

***Literature:***

- Detailed course manual
- Goldstein, J., Newbury, D.E., Joy, D.C., Lyman, C.E., Echlin, P., Lifshin, E., Sawyer, L., Michael, J.R.: Scanning Electron Microscopy and X-ray Microanalysis, Springer Science+Business Media, 2003
- Hawkes, Valdrè: Biophysical Electron Microscopy, Academic Press, 1990
- Egerton: Physical Principles of Electron Microscopy: an introduction to TEM, SEM and AEM, Springer Verlag, 2007

***Prerequisites/Notice:***

No mandatory prerequisites. Please consider the prior attendance to EM Basic lectures (551-1618-00V; 227-0390-00L; 327-0703-00L) as suggested prerequisite.