Summary
Sample preparation and direct observation techniques (optical microscopy, AFM, electron microscopy) and their practical application to the study of morphology and microdeformation in polymers.

Content
INTRODUCTION
• Overview of polymer structures
• Importance of polymer morphology in practice

METHODS
• sample preparation
• application of the different types of microscopy to polymers (OM, TEM, SEM, scanning probe microscopy ...)
• crystallographic methods, numerical simulation

APPLICATIONS
• semicrystalline polymers and liquid crystalline polymers
• supermolecular structures
• fractography and microdeformation
• nanostructures and self-organization

Keywords
Polymers, microscopy, specimen preparation

Learning Prerequisites
Recommended courses
Polymères, structures, propriétés, MSE-230, MX, Plummer

Important concepts to start the course
Basics of materials science, physics

Learning Outcomes
By the end of the course, the student must be able to:
• Compare the advantages and disadvantages of the various techniques
• Describe the main microscopy techniques and their application to polymers
• Recall the principal methods of specimen preparation for SEM/TEM
• Choose a technique for a given problem in polymer science
• Develop a rational approach to solving multiscale problems in polymer science
• Operate an optical microscope in different modes
• Apply basic optical microscopy to the study of polymers
• Assess / Evaluate the use of different microscopy techniques in the literature

Transversal skills
• Make an oral presentation.
• Summarize an article or a technical report.

Teaching methods
Ex cathedra, demonstrations

Expected student activities
Attending lectures and laboratory demonstrations, completing exercises, analysis and presentation of a scientific article from the literature

Assessment methods
Written exam after 4-5 weeks + oral presentation in group of 2 people at the end of the course.
Final grade = (2x presentation grade + 1x written exam grade) /3

Resources
Bibliography

Ressources en bibliothèque
• Polymer microscopy / Sawyer

Notes/Handbook
Copies of the lecture notes

Websites
• http://my.epfl.ch
• http://www.olympusmicro.com/primer/