Principles of Light Microscopy Course

September 4, 2023 - September 8, 2023

CRTD

Scientific Program

PRELIMINARY OVERVIEW OF THE COURSE TOPICS

Monday
- Resolution, Contrast, Magnification, Lenses: how they work and what they can do. Importance of Numerical Aperture
- Geometrical optics
- Illumination methods
- Choice of optical components
- Summary of setting up the microscope illumination
- Lens aberrations and their correction

Practical:
Model microscope on an optical bench, identifying components of the microscope, setting up Koehler illumination

Tuesday
- Diffraction and Image formation
- Demonstration of Abbe's diffraction experiments
- Methods of enhancing contrast (1): bright field, dark field, phase contrast

Practical:
Dark field microscopy, phase contrast microscopy

Wednesday
- Methods of enhancing contrast (2): Polarised light, Differential Interference Contrast (DIC)
- Introduction to fluorescence

Practical:
Polarized light microscopy, DIC

Thursday
- Methods of enhancing contrast (3): Fluorescence microscopy
- Introduction to digital imaging using scientific cameras (CCD, sCMOS)
- Introduction into image processing

Practical:
Fluorescence microscopy, digital imaging using scientific cameras, image processing with example data

Friday
- Basic introduction to advanced optical sectioning methods and deconvolution (laser scanning confocal microscopy, two photon microscopy, spinning disk confocal microscopy, TIRF microscopy, light-sheet microscopy, super resolution light microscopy
- What you need to know about planning your imaging experiments
- Round table course discussion and evaluation

Practical:
Demonstration of key components of advanced imaging systems

The schedule might change slightly during the course to accommodate to students requests.