### Summary
Introduction to geometrical and wave optics for understanding the principles of optical microscopes, their advantages and limitations. Describing the basic microscopy components and the commonly used biomicroscopy methods such as widefield and fluorescence.

### Content
Geometrical and matrix (ABCD) optics, wave and Fourier optics, point-spread function (PSF), resolution and contrast, microscope elements (objectives, eyepiece, filters, illuminations, detectors), fluorescence microscopy, and preparation of biological samples for microscopy.

### Keywords
Optical microscopy, fluorescence, wide field microscopy.

### Learning Prerequisites
**Required courses**
Analysis IV, Linear algebra, General physics III/IV.

**Important concepts to start the course**
Basic matrix calculations, Fourier transformation, electromagnetic waves, refraction and reflection.

### Learning Outcomes
By the end of the course, the student must be able to:
- Sketch basic optical systems.
- Sketch wide field and fluorescence microscopes.
- Estimate the resolution of imaging systems.
- Propose a suitable microscopy configuration for imaging a sample.
- Characterize the basic elements of a microscope

### Transversal skills
- Communicate effectively with professionals from other disciplines.

### Teaching methods
Lecturing with exercises.

Expected student activities
Following the lecturing and solving the exercises regularly is necessary for mastering the course contents. The solutions of the exercises are distributed at the next lecture. The student is invited to find his/her own solutions and to discuss them with the assistants.

Assessment methods
Continuous evaluation with two intermediate exams: the mean grade will constitute the final grade. Allowed support: Notes are allowed on 2 sheets of A4 papers (recto-verso on both). Handwritings and prints are both accepted.

Supervision
- Office hours: No
- Assistants: Yes
- Forum: Yes
- Others: Possible to take dates.

Resources
Bibliography
- Eugene Hecht, Optics (2002).

Ressources en bibliothèque
- Optique : fondements et applications / Pérez
- Optics / Hecht
- Optics / Klein
- Principles of optics: electromagnetic theory of propagation, interference and diffraction of light / Born
- Fundamentals of Light Microscopy and Electronic Imaging / Murphy
- Fundamentals of Photonics / Saleh

Notes/Handbook
Script covering geometrical and matrix optics, Fourier optics, microscopy and fluorescence. Script chapters and course slides are published on Moodle.

Websites
- http://www.olympusmicro.com/
- http://zeiss-campus.magnet.fsu.edu/tutorials/index.html

Moodle Link

Prerequisite for