Summary
Study of advanced image processing; mathematical imaging. Development of image-processing software and prototyping in Jupyter Notebooks; application to real-world examples in industrial vision and biomedical imaging.

Content
- **Directional image analysis.** Mathematical foundations. Structure tensor. Steerable filters.
- **Computational imaging.** Imaging as an inverse problem. Iterative reconstruction methods. Elements of convex analysis. Regularization & sparsity constraints.

Learning Prerequisites
**Required courses**
Image Processing I

**Recommended courses**
Signals and Systems I & II, linear algebra, analysis

**Important concepts to start the course**
Basic image processing and related analytical tools (Fourier transform, z-tranform, etc.)

Learning Outcomes
• Construct interpolation models and continuous-discrete representations
• Analyze image transforms
• Design image-reconstruction algorithms
• Formalize multiresolution representations using wavelets
• Perform image analysis and feature extraction
• Design image-processing software
• Design image reconstruction algorithms

Transversal skills
• Plan and carry out activities in a way which makes optimal use of available time and other resources.
• Manage priorities.
• Access and evaluate appropriate sources of information.
• Use both general and domain specific IT resources and tools

Assessment methods
The objectives of the course will be assessed as follows:
• 70% final exam
• 30% IP labs

Resources
Moodle Link
• https://go.epfl.ch/MICRO-512