

## Optical Image Modeling and Processing

### Course Structure

This course consists of approximately 36 hours of lectures with labs and 108 hours of projects. Volume of the course 4.0 ECTS credits.

### Course Description

If you want to know more about optical image formation and processing, understand how aberration influence into optical image quality and how you can improve optical image quality, if you want to practice in creating optical image software by your own - this course is for you!

The course includes basic optical imaging theory (electromagnetic waves, Maxwell's equation, diffraction and image formation, partial coherence, aberration and image quality, etc.) and basic principles of image processing (improving the visual quality of the image, various operations with the image, etc.).

Projects are includes optical image modeling and optical image processing in C++ programming language.

### Lectures and Labs

- Basics of electromagnetic theory. Maxwell's equations and the wave equation. Imaging theory. Diffraction.
- Mathematical description and algorithms of image forming at coherent, incoherent and partial coherent illumination.
- Image quality parameters. Aberrations. PSF. MTF.
- Digital optical image registration and coding. Basics digital image processing.
- Geometrical, arithmetic and logical image transformations. Image filtering and image recovery.

### Projects

- The simulation of the image formation in coherent, incoherent and partially coherent light.
- Modeling and study of the influence of various factors on the optical image and its quality.
- Modeling and research of optical image preparation methods.
- Modeling and research of methods of geometrical, logical and arithmetic optical image transformations.
- Modeling and study of the influence of various parameters on the optical image filtering methods result.