ITMO University

Modern Methods of Optical Micro- and Spectroscopy

Course Workload		Assessment form (examination/ graded test/ ungraded test)
ECTS	Hours	
6	216	Exam

This course represents basic information in the field of optical microscopy and spectroscopy, taking into account the specifics of their application for biomedical research.. The optical microscope working theory, systems, and methods of spectral analysis are described in detail. The state-of-the-art miscopy and spectroscopy techniques, including super-resolution microscopy and time-resolved measurements, are also considered

Course structure:

1. Basics of microscopy methods

1.1. The History of Microscopy
1.2. Basics of optical microscopy (OM): image formation, resolution, microscope construction, optical aberrations
1.3. Transmitted light microscopy, Köhler illumination, contrast-enhancing techniques
1.4. Advanced OM: optical sectioning methods

2. Basics of spectroscopy methods

2.1. Basics of optical spectroscopy (OS): light absorption, luminescence, and scattering, characteristics of optical radiation
2.2. Spectroscopic instrumentation and spectral analysis of optical radiation
2.3. Light sources for OS
2.4. Detectors for OS

3. State-of-the-arts methods of micro- & spectroscopy

3.1. Fluorescence light microscopy and time-resolved measurements
3.2. Fluorescence lifetime imaging
3.3. Super-resolution microscopy: stimulated emission depletion (STED)
3.4. Fluorescence resonance energy transfer (FRET)
3.5. Fluorescence correlation spectroscopy
3.6. Data analysis and postprocessing