

Fluorescence Microscopy Short Course

June 23-26, 2025 Microscopy and Imaging Center, Texas A&M University

All lectures are in ILSB 1143, **9am-noon**

Monday, June 23:

- Theory of Image formation; limits of resolution (Vitha)
- Properties of microscope objectives, numerical aperture, aberrations (Vitha)
- Principles of Fluorescence; Fluorophores, filters, cameras (Vitha)

Lab session 1:00-4:00 pm: ILSB, Rm 1119, 1122

- Wide-field fluorescence imaging on upright and inverted microscopes (Vitha, Gibbs, ...)
- Comparison of color and monochrome cameras.
- sCMOS vs. machine vision CMOS cameras – noise comparison, ..
- wide-field fluorescence vs. confocal imaging (Olympus FV1000-Vitha)

Tuesday, June 24:

- Confocal microscopy – point scanning and spinning disk confocal systems (Vitha)
- Detectors for confocal imaging: PMT, HyD, SPAD, SiLVR.. (Vitha)
- 3D Image restoration – deconvolution of wide-field and confocal images (Vitha)

Lab Session: 1pm to 4 pm: BSBW Rm. 017

- Nikon AXR microscope (BSBW Rm. 017; Maynard)
- Nikon nSPARC Superresolution system (BSBW Rm. 017; Vitha)
- Nikon multi-photon microscope (BSBW 017; Gibbs)

Wednesday, June 25:

- Light Sheet Microscopy (Gibbs)
- Multi-photon fluorescence microscopy and SHG (Gibbs)
- Fluorescence Lifetime Imaging (FLIM) and other advanced methods (FCS, RICS, FRAP, ..) (Vitha)
- Superresolution microscopy (Vitha)

Lab session: : 1pm to 4 pm: ILSB rm. 1117, 1128;

- Zeiss Z1 Lightsheet microscope (ILSB 1128; Gibbs)
- Leica SP8 FILM/STED/ confocal system – demonstration of FLIM, STED superresolution (ILSB 1117; Vitha)

Thursday, June 26:

- Quiz (~30 minutes)
- Introduction to Image processing and analysis: file formats, preserving data integrity, metadata. Ethical guidelines (Vitha/Gibbs)
- ImageJ/FIJI basic concepts, image adjustments and filtering, thresholding and measurements (Vitha/Gibbs)
- Introduction to Imaris (Gibbs)
- Basic workflow from Image capture to Publication, using (mostly) free software tools (Fiji, GIMP, Scribus, ..) (Vitha/Gibbs)
- Short Course Certificates are issued

Lab session: ISLB 1143, 1135

- ImageJ/FIJI use (on participant's laptop computers)
- Individual or small group sessions with Imaris, LASX FLIM, ...
- Q/A, topics of interest
- Additional Leica SP8 confocal/FLIM/STED/Lightning deconvolution or other imaging and demonstration in the MIC.