MICROSCOPIA OTTICA IN BIOLOGIA CELLULARE [675SM]

MICROSCOPY IN CELL BIOLOGY –

aa 2023/2024, 2nd semester

Aula ex-Cla, edificio C1, 15-18

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Dipartimento di Scienze della Vita

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date	lesson/lab	aula	time
06/03/24	intro	Aula Ex-Cla, C1	15-16
13/03/24	lesson1	Aula Ex-Cla, C1	15-18
20/03/24	Lesson2+lab	sala microscopia F2, C1	15-18
27/03/24	lesson3	Aula Ex-Cla, C1	15-18
10/04/24	lesson4	Aula Ex-Cla, C1	15-18
17/04/24	lesson5	Aula Ex-Cla, C1	15-18
24/04/24	Lesson6+lab2	Aula Ex-Cla, C1	15-18
08/05/24	lab2	sala microscopia F2, C1	15-18
15/05/24	lab3	CIMA center, groupI	15-17
22/05/24	lab3	CIMA center, groupII	15-17

12 h lab + 16 h lessons

1. Lesson 1 - How a microscope works

1.1. Image formation
1.2. Magnification vs resolution
1.3. Numerical aperture and working distance
1.4. Objectives
1.5. Point-spread function and Airy disk
1.6. Optical abberations

2. Lesson2 + Lab – Contrasting techniques

2.1. Brightfield
2.2. Darkfield
2.3. Phase Contrast
2.4. Polarization Contrast
2.5. Differential Interference Contrast (DIC)

3. Lesson 3 - Flourescence microscopy

3.1. Flourescence principle

3.2. Absorption and Emission spectra - Stoke's shift

3.3. The flourescence microscope –
light sources, filter, dicroic mirror

3.4. Fluorophores

3.5. Staining with flourophores

3.6. Problems with flourescence imaging

3.7. Multichannel imaging

5. Lesson 4 – Confocal, super-resolution and 2-photon microscopy

5.1. TIRF microscopy

5.2. Confocal microscopy

5.3. 2-photon microscopy

5.4. Superresolution microscopy

- 5.4.1. SIM microscopy
- 5.4.2. STED microscopy
- 5.4.3. PALM microscopy
- 5.4.4. STORM microscopy

5.5. FRET microscopy

5.6. FRAP microscopy

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lab3

6. Lesson5- Live-imaging techniques

6.1. Incubation

6.2. The life-imaging microscope

6.3. Contrasting techniques

6.4. Flourescent labelling of live cells

6.5. Resolution – Speed – Sensitivity

6.6. Examples

7. Lesson6 - Quantitative microscopy – Imaging processing and analysis

7.1. Digital images
7.2. Resolution
7.3. Signal-to-noise
7.4. Sampling
7.5. Quantization

8. Lab2 – Image processing and analysis using ImageJ

8.1. Histogram and LUTs
8.2. Noise, Filters and Background
8.4. ROIs and measurements
8.5. Threshold, watershed and particle analysis
8.6. Live imaging analysis