

Principles and Practice of Microscopy

Prof. Noemi Tel-Zur

2 credits – limited to 10 students (1-2-2078)

Course contents:

This is an introductory course with laboratory classes for students with an interest in microscopy or who will need to use microscopy in their research work. The course will cover a general theoretical introduction to microscopy and a comparison of different tools and methods, including stain techniques. The laboratory part includes operation of binocular and bright-field microscopes and sample preparation.

Topics:

- 1- Overview: a history of microscopy, properties of light, and optical image formation.
- 2- Microscope parts and anatomy – Lenses, objective, ocular, upright vs inverted.
- 3- Types of microscopes – binocular, bright-field, polarized, phase-contrast, differential interference contrast (DIC), fluorescence (filters); and electron (SEM, TEM) microscopes.
- 4- Confocal microscope – principles, uses and practical demonstration.
- 5- LCM (Laser Capture Microdissection).
- 6- Stain techniques.
- 7- Cameras and imaging (color and monochrome)
- 8- Analysis of microscope images.

Class #1: Overview: a history of microscopy, properties of light, and optical image formation.

Class #2: Microscope parts and anatomy – Lenses, objective, ocular, upright vs inverted.

Class #3: Binocular – Uses and limitations: practical demonstration of tissues/organisms, including fluorescent use and images.

Class #4: LCM (Laser Capture Microdissection) – Uses and limitations: practical demonstration of tissues/organisms, including fluorescent use and images.

Class #5: Types of microscopes – bright-field, polarized, phase-contrast, differential interference contrast (DIC), fluorescence (filters).

Class #6: Electron (SEM, TEM) and confocal microscope – principles and uses.

Class #7: Stain techniques.

Class #8: Confocal - Practical demonstration.

Class #9: Cameras and imaging (color and monochrome)

Class #10: Analysis of microscope images.

Classes #11-13: Demonstrations

Bright-field and fluorescence use. Human, animal and plant sample preparation. Scale-bar use.

Grading components:

Lab project and report (80%) + attendance and participation in class (20%).