



## Course Syllabus

1. **Subject:** SCBM 375 Microscopy and Bioimaging

2. **Credit:** 2 (1-2-3)

### 3. Instructor

#### 3.1 Course Coordinator

Asst.Prof. Dr. Chinnawut Suriyonplengsaeng    Assoc.Prof. Dr. Krai Meemon  
Asst.Prof. Dr. Morakot Sroyraya                      Lecturer Dr. Niwat Kangwanrangsan  
Asst.Prof. Dr. Puey Ounjai                              Assoc.Prof. Dr. Rapeepun Vanichviriyakit  
Asst.Prof. Dr. Thanapong Kruangkum              Assoc.Prof. Dr. Wattana Weerachatanukul  
Asst.Prof. Dr. Worawit Suphamungmee\*

\*Course coordinator: Department of Anatomy (B118 – Phayathai)

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4. **Semester/Academic Year:** 2/2021

5. **Pre-requisite/Co-requisite:** SCBM 214 Structure of Cell and Tissue

6. **Study Location:** Faculty of Science, Mahidol University

### 7. Course Description:

Microscopy; Optical microscope; Immunohistochemistry; Electron microscope; Biological imaging

### 8. Total Hours:

Lecture (hours)	Laboratory (hours)	Self-study (hours)
15	30	45



## 9. Objectives:

- 9.1 Describe principle and applications of microscopy.
- 9.2 Explain major components and basic operations of light and electron microscopes.
- 9.3 Explain routine procedures of specimen preparations in the microscopy techniques.
- 9.4 Discuss the advantage of biological imaging methods including the quality of the microscopic images.

## 10. Course schedule: Lecture & Lab: Monday

Week	Dates	Times	Topics	Lecturers
1	Jan 10	13.00-14.00	<b>Lecture 1:</b> Course orientation & Introduction of biological imaging: current microscopy techniques & cellular imaging	Worawit
		14.00-15.00	<b>Lecture 2:</b> Principle of light microscopy (LM)	Wattana
		15.00-16.00	<b>Lecture 3:</b> Optical components of light microscope	Wattana
2	Jan 17	13.00-14.00	<b>Lecture 4:</b> Bright field microscope, dark field microscope, phase contrast & differential interference contrast microscopes	Niwat
		14.00-15.00	<b>Lecture 5:</b> Preparation technique for light microscopy: Paraffin technique & staining methods	Niwat
3	Jan 24	13.00-15.00 (MDL2)	<b>Lab 1:</b> Understanding the instrument: light microscope (hand-on session)	Worawit Rapeepun
		15.00-17.00 (AN1-110)	<b>Lab 2:</b> Image visualizing practice and digital imaging tool (hand-on session)	Morakot Chinnawut Thani
4	Jan 31	13.00-15.00	<b>Lab 3:</b> Tissue preparation for paraffin technique (hand-on session)	Niwat
		14.00-17.00 (Pr-xxx)	<b>Lab 4:</b> Routine staining and special staining (hand-on session)	Worawit Chinnawut Jakkrapong Thidarat
5	Feb 7	13.00-15.00 (AN1-110)	<b>Lab 5:</b> Digital imaging of stained specimen (LM; hand-on session)	Worawit Rapeepun Morakot Chinnawut Thani
6	Feb 14	13.00-14.00	<b>Lecture 6:</b> Principle of fluorescence microscopy (epifluorescence/inverted fluorescence)	Thanapong
		14.00-15.00	<b>Lecture 7:</b> Principle of confocal microscopy	Thanapong



7	Feb 21	13.00-14.00	Lecture 8: Principle of immunohistochemistry: Immunoperoxidase and immunofluorescence techniques	Thanapong
		14.00-15.00	Lecture 9: <i>In situ</i> hybridization technique	Krai
8	Feb 28	13.00-15.00	Lab 6: Immunofluorescence staining (hand-on session)	Thanapong
		15.00-17.00 (MDL2)	Lab 7: Immunoperoxidase staining (hand-on session)	Krai Rapeepun Morakot Thani
9	Mar 7	13.00-15.00 (AN1-110)	Lab 8: Digital imaging of immunoperoxidase-stained specimen (hand-on session)	Thanapong Krai
		15.00-17.00 (B-200)	Lab 9: Digital imaging of immunofluorescence-stained specimen / confocal (hand-on session)	Rapeepun Morakot Wattapong
10	Mar 14	13.00-14.00	Lecture 10: Principle of transmission electron microscopy (TEM)	Worawit
		14.00-15.00	Lecture 11: Preparation technique for TEM	Worawit
11	Mar 21	13.00-14.00	Lecture 12: Principle of scanning electron microscopy (SEM)	Worawit
		14.00-15.00	Lecture 13: Preparation technique for SEM	Worawit
12	Mar 28	13.00-14.00	Lecture 14: Image analysis of electron microscopy	Puey
		14.00-15.00	Lecture 15: Bioimaging application and software - ImageJ	Puey
13	Apr 4	13.00-15.00	Lab 10: TEM specimen preparation (hand-on session)	Worawit
		15.00-17.00 (B-200)	Lab 11: Basic operation of TEM (demonstration)	Puey Wattapong Jirawadee
14	Apr 11	13.00-15.00	Lab 12: SEM specimen preparation (hand-on session)	Worawit
		15.00-17.00 (B-200)	Lab 13: Basic operation of SEM (hand-on session)	Puey Wattapong Jirawadee
15	Apr 18	13.00-15.00	Lab 14: Conference-I: Instrument & preparation techniques I	Worawit
		15.00-17.00 (AN1-202)	Lab 15: Conference-II: Instrument & preparation techniques II (group presentations I & II)	Thanapong Morakot Rapeepun Thani
16	May 3	9.00-12.00	Examination	
17	May 6	12.00	Submission Due for Individual Lab's Report	



## 11. Evaluation:

Examination	40%
Individual lab's report	25%
Lab presentation	20%
Class attendance (15 activities)	15%

## 12. References:

### Textbooks:

- Bozzola JJ, Russell LD. (1998). *Electron Microscopy*. 2<sup>nd</sup> ed. Jones & Bartlett Learning. ISBN-10: 0763701920.
- Chandler DE, Robertson RW. (2008). *Bioimaging: Current Concepts in Light and Electron Microscopy*. 1<sup>st</sup> ed. Jones & Bartlett Learning. ISBN-10: 0763738743.
- Mertz, J. (2019). *Introduction to Optical Microscopy*. 2<sup>nd</sup> ed. Cambridge: Cambridge University Press. doi:10.1017/9781108552660
- Murphy DB, Davidson MW. (2013). *Fundamentals of Light Microscopy and Electronic Imaging*. 2<sup>nd</sup> ed. Wiley-Blackwell. ISBN-10: 047169214X.
- Williams DB, Carter CB. (2009). *Transmission Electron Microscopy: A Textbook for Materials Science*, Vol. 4 set. 2<sup>nd</sup> eds. Springer. ISBN: 0387765026.
- Sanderson J. (2019). *Understanding Light Microscopy*. 1<sup>st</sup> ed. Wiley. ISBN-10: 0470973757.

### External resources:

- <https://micro.magnet.fsu.edu/primer/anatomy/anatomy.html>
- <https://www.microscopyu.com/>
- <https://www.olympus-lifescience.com/en/microscope-resource/primer/anatomy/introduction/>
- <https://www.open.edu/openlearn/science-maths-technology/biology/introduction-microscopy/content-section-0?intro=1>