

**SCPA 603: Histopathological Techniques  
for Routine and Research  
Year 2018**

**Department of Pathobiology  
Mahidol University**

## Course Syllabus

(Lecture-Lab-Self-study)

### SCPA 603    **Histopathological Techniques** for Routine and Research

**2(1-2-3)**

Histopathological techniques for routine work in pathology; Tissue collection and preparation, paraffin embedding technique, basic tissue staining; Modified techniques for research, frozen staining, immunological staining, photomicrography

**Prerequisite**            None

**Session**                1<sup>st</sup> Semester

**Course Conditions**    class size: None

#### Course Objectives

At the completion of the course, students should be able to:

1. Explain the principle of histopathological techniques in routine and research
2. Interpret histopathological changes of damages and diseases
3. Practice in histopathological techniques
4. Discuss, analyze and solve the problem from histological techniques

#### Course Outline

Weeks	Topic	Hour			Instructor
		Lecture/ Discussion	Lab.	Self-study	
1	Introduction to histological techniques	1	2	3	Staff of Pathobiology
	Tissue collection	1	2	3	
2	Tissue fixation	1	2	3	
	Tissue processing	1	2	3	
	Embedding and sectioning	1	2	3	
3	H&E staining	1	2	3	
	Interpretation of H&E staining 1: Cell injury and inflammation	1	2	3	
	Interpretation of H&E staining 2: Neoplasia	1	2	3	
<b>Exam</b>	<b>Examination: Lecture</b>	<b>L 2-8</b>			
	<b>Examination: Laboratory</b>	<b>Lab 2-8</b>			
4	Special staining 1	1	2	3	
	Special staining 2	1	2	3	

Weeks	Topic	Hour			Instructor
		Lecture/ Discussion	Lab.	Self-study	
	Frozen section	1	2	3	
5	Immunohistochemistry	1	2	3	Staff of Pathobiology
	Photomicrography	1	2	3	
	Troubleshooting of histological techniques	1	2	3	
6	Discussion	1	2	3	
Exam	Examination: Lecture	L 9-14			
	Examination: Laboratory	Lab 9-14			

### Teaching methods

1. Lectures in class 15 hours.
2. Students design and carry out experiments in laboratory session 30 hours.

### Teaching Media

1. Class handouts, Powerpoint presentation, Publications

### Measurement and Evaluation of Students Achievement

1. Written examination in theory and laboratory 40%
2. Discussion, Participation and interactive performance in laboratory 35%
3. Oral presentation of assignment 25%
4. Student Examination Grade = A, B+, B, C+, C, D+, D, F

### Course Evaluation

1. Students gain knowledge according to the course objectives.
2. Students give written course evaluation at the end of the course.
3. Evaluate students' satisfaction towards teaching and learning of the course using a questionnaire.
4. The lecturer will be notified with the result of the course evaluation from students to further improve the lecturing process.

**Reference**

1. Suvarna KS, Layton C. Bancroft JD. Bancroft's Theory and Practice of Histological Techniques. 7th edition. Churchill Livingstone Elsevier: Canada. 2013. 654p.

**Instructors**

1. NC = Dr. Nisamanee Charoenchon
2. NK = Dr. Niwat Kangwanrangsan
3. PC = Dr. Pornthip Chaichompoo
4. PS = Assistant Professor Dr. Prasit Suwannalert
5. SN = Somphong Narkpinit
6. WJ = Associate Professor Dr. Wannee Jiraungkoorskul
7. WP = Dr. Witchuda Payuhakrit

**Coordinator** Dr. Witchuda Payuhakrit

Department of Pathobiology, Faculty of Science, Mahidol University

Tel. 02-201-5572, E-mail: [witchuda.pay@mahidol.ac.th](mailto:witchuda.pay@mahidol.ac.th)

## **Leading Questions**

### **L1 Introduction to histological techniques**

- What are the benefits of histopathology techniques?

### **L2 Tissue collection**

- What are the principals and processes of tissue collection?

### **L3 Tissue fixation YN**

- What are the benefits for tissue fixation in pathology?

### **L4 Tissue processing**

- What are the health effects caused by exposure to alcohol, xylene or paraffin?

### **L5 Embedding and sectioning**

- What are the rotary microtome parts and function?

### **L6 H&E staining YN**

- What are the principals of Hematoxylin and Eosin staining?

### **L7 Interpretation of H&E staining 1: Cell injury and inflammation**

- How are the difference histopathological changes between apoptosis and necrosis
- How are the difference histopathological changes of acute and chronic inflammation

### **L8 Interpretation of H&E staining 2: Neoplasia**

- How to diagnose histopathology of benign and malignant neoplasms?

### **L9 Special staining I**

- What are the differences between special stain and H&E staining?

### **L10 Special staining II**

- What are the advantages of special staining?

**L11 Frozen section**

- What are the special properties of this section type over other types of sectioning?

**L12 Immunohistochemistry**

- How to diagnosis prostate cancer using the immunohistochemistry?

**L13 Photomicrography**

- What are the important factors involved in the image formation and image quality?

**L14 Troubleshooting of histological techniques**

- Why do we need to concern about artefacts on histopathological slides?

### Lesson Plan

1. Topic	L1 : Introduction to histological techniques
2. Name Lecturer	Witchuda Payuhakrit
Education	Ph.D. (Pathobiology)
Position	Lecturer
Contact	02-201-5572, Email: witchuda.pay@mahidol.ac.th
3. Course	Histopathological Techniques for Routine and Research (SCPA603)
4. Programme Title	M.Sc. and Ph.D. in Pathobiology
5. Date and Time	15 August 2018, 9:00-12:00 PM.
6. Topic Objective	At the completion of this unit the student will be
	<ol style="list-style-type: none"> <li>1. Understand the application of histological techniques</li> <li>2. Describe the basic techniques in histological techniques</li> <li>4. Applied the histological techniques for routine and research</li> </ol>
7. Topic Details	
	<ol style="list-style-type: none"> <li>1. The application of histological techniques</li> <li>2. Basic techniques in histological techniques</li> <li>3. Histological techniques for publication</li> </ol>
8. Learning Methods	Lecture, Presentation, Group discussion
9. Teaching Media	Power point presentation, Handout, Text books, Publications
10. Teaching Equipment	Computer, LCD
11. Examination and Evaluation	Written examination
12. Date of Improvement	25 July 2018

### Lesson Plan

1. Topic	L2 : Tissue collection
2. Name Lecturer	Somphong Narkpinit
Education	MD
Position	Lecturer
Contact	02-201-5550, Email : somphong.nar@.mahidol.ac.th
3. Course	Histopathological techniques for routine and research (SCPA 603)
4. Program Title	M.Sc. and Ph.D. in Pathobiology
5. Date and Time	15 August 2018, 1.00-4.00 PM
6. Topic Objective	At the completion of this unit the student will be able to
	<ol style="list-style-type: none"> <li>1. Describe the principal and processes of tissue collection</li> <li>2. Describe the techniques of tissue fixation for various organ</li> </ol>
7. Topic Detail	
	principal and processes of tissue collection , techniques of tissue fixation for various organ
8. Learning Methods	Lecture, Laboratory and Self study
9. Teaching Media	Handout, Text book, Glass slide, Gross specimen, and CAI
10. Teaching Equipment	Computer, LCD, Microscope
11. Examination and Evaluation	Posttest and examination by short assay
12. Date of Improvement	30 July 2018



### Lesson Plan

1. Topic	L3 : Tissue fixation
2. Name Lecturer	Dr. Yaowarin Nakornpakdee
Education	Ph.D. (Medical Microbiology)
Position	Lecturer
Contact	02-201-5578, Email: yaowarin-arin@hotmail.com
3. Course	Histopathological Techniques for Routine and Research (SCPA 603)
4. Program Title	M.Sc. and Ph.D. in Pathobiology
5. Date and Time	20 August 2018, 1.00-4.00 PM
6. Topic Objective	At the completion of this unit the student will be able to describe and discuss in the topics:
1. Tissue fixation for pathology	
7. Topic Detail	
1. Tissue fixation for pathology	
8. Learning Methods	Lecture, Discussion, Laboratory, and Self study
9. Teaching Media	Handout, Text book, Gross specimen, and Glass slide
10. Teaching Equipment	Computer, LCD, Microscope
11. Examination and Evaluation	Participate in Discussion, Examination by short assay
12. Date of Improvement	29 July 2018

### Lesson Plan

1. Topic	L4 : Tissue processing
2. Name Lecturer	Dr. Wannee Jiraungkoorskul
Education	Ph.D. (Biology)
Position	Associate Professor
Contact	02-201-5563, 5571, Email : wannee.jir@mahidol.ac.th
3. Course	Histopathological Techniques for Routine and Research (SCPA 603)
4. Program Title	M.Sc. and Ph.D. in Pathobiology
5. Date and Time	22 August 2018, 9.00-12.00 AM
6. Topic Objective	At the completion of this unit the student will be able to
	<ol style="list-style-type: none"> <li>1. Describe the purpose of dehydration, clearing and infiltration processes.</li> <li>2. Describe the criteria in choosing reagents in each step.</li> <li>3. Describe problem and troubleshoot encountered within each step.</li> </ol>
7. Topic Detail	
	Purpose of dehydration, clearing and infiltration processes, The criteria in choosing reagents, Problem and troubleshoot encountered within each step
8. Learning Methods	Lecture, Lab experiment, Self-study, Group discussion
9. Teaching Media	Power point presentation, Handout, Text book
10. Teaching Equipment	Computer, LCD, Microscope
11. Examination and Evaluation	Examination, Posttest, Lab report
12. Date of Improvement	29 July 2018

### Lesson Plan

1. Topic	L5 : Embedding and Sectioning
2. Name Lecturer	Dr. Wannee Jiraungkoorskul
Education	Ph.D. (Biology)
Position	Associate Professor
Contact	02-201-5563, 5571, Email : wannee.jir@.mahidol.ac.th
3. Course	Histopathological Techniques for Routine and Research (SCPA 603)
4. Program Title	M.Sc. and Ph.D. in Pathobiology
5. Date and Time	22 August 2018, 1.00-4.00 PM
6. Topic Objective	At the completion of this unit the student will be able to
	<ol style="list-style-type: none"> <li>1. Describe the purpose of embedding and sectioning processes.</li> <li>2. Describe the propose and how to use rotary microtome, water bath, adhesive, warmer in the sectioning process.</li> <li>3. Describe problems and troubleshooting in the process.</li> </ol>
7. Topic Detail	
Purpose of embedding and sectioning, How to use the equipment, Problems and troubleshooting	
8. Learning Methods	Lecture, Lab experiment, Self-study, Group discussion
9. Teaching Media	Power point presentation, Handout, Text book
10. Teaching Equipment	Computer, LCD, Microscope
11. Examination and Evaluation	Examination, Posttest, Lab report
12. Date of Improvement	29 July 2018

### Lesson Plan

1. Topic	L6 : H&E staining
2. Name Lecturer	Dr. Yaowarin Nakornpakdee
Education	Ph.D. (Medical Microbiology)
Position	Lecturer
Contact	02-201-5578, Email: yaowarin-arin@hotmail.com
3. Course	Histopathological techniques for routine and research (SCPA 603)
4. Program Title	M.Sc. and Ph.D. in Pathobiology
5. Date and Time	27 August 2018, 1.00-4.00 PM
6. Topic Objective	At the completion of this unit the student will be able to
	<ol style="list-style-type: none"> <li>1. Describe the principals of hematoxylin and Eosin staining used in histological techniques</li> <li>2. Describe the application and advantages of hematoxylin and Eosin staining.</li> <li>3. Describe Procedure for H &amp; E Staining</li> </ol>
7. Topic Detail	
	The principal, application, advantages and Procedures of hematoxylin and Eosin staining.
8. Learning Methods	Lecture, Laboratory and Self study
9. Teaching Media	Handout, Text book, Glass slide, Gross specimen, and CAI
10. Teaching Equipment	Computer, LCD, Microscope
11. Examination and Evaluation	Posttest and examination by short assay
12. Date of Improvement	30 July 2018

### Lesson Plan

1. Topic	L7 : Interpretation of H&E staining : cell injury and inflammation
2. Name Lecturer	Somphong Narkpinit
Education	MD
Position	Lecturer
Contact	02-201-5550, Email : somphong.nar@.mahidol.ac.th
3. Course	Histopathological techniques for routine and research (SCPA 603)
4. Program Title	M.Sc. and Ph.D. in Pathobiology
5. Date and Time	29 August 2018, 1.00-4.00 PM
6. Topic Objective	At the completion of this unit the student will be able to
	<ol style="list-style-type: none"> <li>1. Describes the microscopic pictures of cell injury and inflammation by use H&amp;E staining</li> <li>2. Classify the types of cell injury (reversible and irreversible) and inflammation (Acute and chronic)</li> <li>3. Describe the common disease associated cell injury and inflammation by use H&amp;E</li> </ol>
7. Topic Detail	
	Types of cell injury (reversible and irreversible) and inflammation (Acute and chronic), microscopic pictures of cell injury and inflammation and common associated disease.
8. Learning Methods	Lecture, Laboratory and Self study
9. Teaching Media	Handout, Text book, Glass slide, Gross specimen, and CAI
10. Teaching Equipment	Computer, LCD, Microscope
11. Examination and Evaluation	Posttest and examination by short assay
12. Date of Improvement	30 July 2018

### Lesson Plan

1. Topic	L8 : Interpretation of H&E staining 2: Neoplasia
2. Name Lecturer	Dr. Prasit Suwannalert
Education	Ph.D. (Pathobiology)
Position	Associate Professor
Contact	02-201-5558, Email: prasit.suw@mahidol.ac.th
3. Course	Histopathological Techniques for Routine and Research (SCPA 603)
4. Program Title	M.Sc. and Ph.D. in Pathobiology
5. Date and Time	31 August 2018, 1.00-4.00 PM
6. Topic Objective	At the completion of this unit the student will be able to describe and discuss in the topics:
	<ol style="list-style-type: none"> <li>1. Describe the histopathology of benign and malignant neoplasms</li> <li>2. Discuss the characteristics of benign and malignant neoplasms</li> </ol>
7. Topic Detail	
	<ol style="list-style-type: none"> <li>1. Histopathology for benign neoplasms</li> <li>2. Histopathology for malignant neoplasms</li> </ol>
8. Learning Methods	Lecture, Discussion, Laboratory, and Self study
9. Teaching Media	Handout, Text book, Gross specimen, and Glass slide
10. Teaching Equipment	Computer, LCD, Microscope
11. Examination and Evaluation	Participate in Discussion, Examination by short assay
12. Date of Improvement	29 July 2018

### Lesson Plan

1. Topic	L9: Special staining 1
2. Name Lecturer	Witchuda Payuhakrit
Education	Ph.D. (Pathobiology)
Position	Lecturer
Contact	02-201-5572, Email: witchuda.pay@mahidol.ac.th
3. Course	Histopathological Techniques for Routine and Research (SCPA603)
4. Programme Title	M.Sc. and Ph.D. in Pathobiology
5. Date and Time	10 September 2018 (1:00-4:00 Pm.)
6. Topic Objective	At the completion of this unit the student will be
	<ol style="list-style-type: none"> <li>1. Understand the application of special staining</li> <li>2. Classify the types of special staining</li> <li>3. Describe the commonly used techniques in special staining</li> <li>4. Applied the special techniques in histopathology</li> </ol>
7. Topic Details	
	<ol style="list-style-type: none"> <li>1. The application of special staining</li> <li>2. Carbohydrates staining</li> <li>3. Amyloid staining</li> <li>4. Nucleic acid staining</li> </ol>
8. Learning Methods	Lecture, Presentation, Group discussion
9. Teaching Media	Power point presentation, Handout, Text books, Publications
10. Teaching Equipment	Computer, LCD
11. Examination and Evaluation	Written examination
12. Date of Improvement	25 July 2018

### Lesson Plan

1. Topic	L10 : Special staining 2
2. Name Lecturer	Witchuda Payuhakrit
Education	Ph.D. (Pathobiology)
Position	Lecturer
Contact	02-201-5572, Email: witchuda.pay@mahidol.ac.th
3. Course	Histopathological Techniques for Routine and Research (SCPA603)
4. Programme Title	M.Sc. and Ph.D. in Pathobiology
5. Date and Time	12 September 2018 (1:00-4:00 Pm.)
6. Topic Objective	At the completion of this unit the student will be
	<ol style="list-style-type: none"> <li>1. Understand the application of special staining</li> <li>2. Classify the types of special staining</li> <li>3. Describe the commonly used techniques in special staining</li> <li>4. Applied the special techniques in histopathology</li> </ol>
7. Topic Details	
	<ol style="list-style-type: none"> <li>1. Lipid staining</li> <li>2. Microorganisms staining</li> <li>3. Connective tissue staining</li> <li>4. Pigments and minerals staining</li> </ol>
8. Learning Methods	Lecture, Presentation, Group discussion
9. Teaching Media	Power point presentation, Handout, Text books, Publications
10. Teaching Equipment	Computer, LCD
11. Examination and Evaluation	Written examination
12. Date of Improvement	25 July 2018



### Lesson Plan

1. Topic	L11 : Frozen section
2. Name Lecturer	Dr. Nisamanee Charoenchon
Education	Ph.D. (Medicine)
Position	Lecturer
Contact	02-201-5573, Email: nisamanee.cha@mahidol.ac.th
3. Course	Histopathological Techniques for Routine and Research (SCPA 603)
4. Program Title	M.Sc. and Ph.D. in Pathobiology
5. Date and Time	14 September 2018, 1.00-4.00 PM
6. Topic Objective	At the completion of this unit the student will be able to
	<ol style="list-style-type: none"> <li>1. Differentiate function, sample preparation and processes of frozen section from other sections</li> <li>2. Perform in frozen section in target sample including preserve in condition before using in the lab properly and safely</li> </ol>
7. Topic Detail	
	The function sample preparation and processes of frozen section comparing to other types of sections, i.e., paraffin section. Laboratory practice of frozen section.
8. Learning Methods	Lecture, Laboratory, Group discussion and Self study
9. Teaching Media	PPT, Handout, Text book, Gross specimens and Glass slides of histopathology
10. Teaching Equipment	Computer, LCD, Microscope
11. Examination and Evaluation	Lab report, practical and written examination
12. Date of Improvement	30 July 2018

### Lesson Plan

1. Topic	L12 : Immunohistochemistry
2. Name Lecturer	Dr. Pornthip Chaichompoo
Education	Ph.D. (Immunology)
Position	Assistant Professor
Contact	Email: pornthip.chh@mahidol.ac.th
3. Course	Histopathological Techniques for Routine and Research (SCPA 603)
4. Program Title	M.Sc. and Ph.D. in Pathobiology
5. Date and Time	17 September 2018, 1:00 - 4:00 PM
6. Topic Objective	At the completion of this unit the student will be able to
	<ol style="list-style-type: none"> <li>1. Describe principle of immunohistochemistry</li> <li>2. Perform tissue staining using immunohistochemistry technique</li> <li>3. Interpretation of immunohistochemistry stained unknow tissue sample</li> <li>4. Manage and solve the troubleshooting of immunohistochemistry technique</li> <li>5. Apply immunohistochemistry technique to research</li> </ol>
7. Topic Detail	
	<ol style="list-style-type: none"> <li>1. Immunohistochemistry technique: Principle, procedure, control, interpretation and troubleshooting</li> <li>2. Application of immunohistochemistry technique for research</li> </ol>
8. Learning Methods	Lecture, Presentation, Practice
9. Teaching Media	Power point presentation, Handout, Text book, Reagents and Lab equipment
10. Teaching Equipment	Computer, LCD, Lab equipment for IHC staining
11. Examination and Evaluation	Assay Examination
12. Date of Improvement	30 July 2018

### Lesson Plan

1. Topic	L13 : Photomicrography
2. Name Lecturer	Dr. Niwat Kangwanrangsana
Education	Ph.D (Medical Sciences)
Position	Lecturer
Contact	02-201-5576, Email: niwat.kan@mahidol.ac.th
3. Course	Histopathological Techniques for Routine and Research (SCPA 603)
4. Program Title	M.Sc. and Ph.D. in Pathobiology
5. Date and Time	19 September 2018 (1.00-4.00 PM)
6. Topic Objective	At the completion of this unit the student will be able to
	<ol style="list-style-type: none"> <li>1. Understand the concepts of image formation under the microscope</li> <li>2. Explain the process for photomicrography</li> <li>3. Obtain a high quality of microscopic images</li> </ol>
7. Topic Detail	
	<ol style="list-style-type: none"> <li>1. Light and Lens</li> <li>2. Image formation</li> <li>3. Histopathological samples</li> <li>4. How to take photo under the microscope?</li> <li>5. Practice for photomicrography</li> </ol>
8. Learning Methods	Lecture, Group discussion
9. Teaching Media	Power point presentation, Handout, Text books, Publications
10. Teaching Equipment	Computer, LCD, Glass slides, Microscope and camera set
11. Examination and Evaluation	Class participation, written examination and lab report
12. Date of Improvement	30 July 2018

### Lesson Plan

1. Topic	L14 : Troubleshooting of histological techniques
2. Name Lecturer	Dr. Niwat Kangwanrangsana
Education	Ph.D (Medical Sciences)
Position	Lecturer
Contact	02-201-5576, Email: niwat.kan@mahidol.ac.th
3. Course	Histopathological Techniques for Routine and Research (SCPA 603)
4. Program Title	M.Sc. and Ph.D. in Pathobiology
5. Date and Time	21 September 2018 (1.00-4.00 PM)
6. Topic Objective	At the completion of this unit the student will be able to
	<ol style="list-style-type: none"> <li>1. Understand the overall process of histopathological technique</li> <li>2. Explain the causes of artefacts on histopathological slides</li> <li>3. Explain how to solve the problems from several kinds of artefacts</li> </ol>
7. Topic Detail	
	<ol style="list-style-type: none"> <li>1. Summary on histopathological techniques</li> <li>2. Artefacts on histopathological slides: causes and effects</li> <li>3. How to solve the problems from artefacts</li> </ol>
8. Learning Methods	Lecture, Group discussion, Practice
9. Teaching Media	Power point presentation, Handout, Text books, Web site
10. Teaching Equipment	Computer, LCD, Glass slides, Microscopes
11. Examination and Evaluation	Class participation and written examination
12. Date of Improvement	30 July 2018