HISTOTECHNIQUES

BIOL 413 002 (CRN 21459)/EVPP 413 002 (CRN 21460)

3 Credit Hours

GEORGE MASON UNIVERSITY
Spring Semester 2020
EXPL 2602 (Lecture), DKH 3060–3061 (Lab)

Location varies with date (see schedule)
1:30–4:15 p.m. Mondays

Instructor: Dr. Esther Peters
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Office Hours, DK 3050: 4:30–5:30 p.m. Mondays, or by appointment

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https://alert.gmu.edu
See Emergency Preparedness Guides at (http://ehs.gmu.edu/guides_EP.html)

Course Description

Students will examine the science of histotechnology and apply these methods to prepare plant or animal tissue samples for the study of cells, tissues, organs, and organ systems using microscopy. The function and condition of cells and tissues are reflected in their microscopic structure and composition and these visual records augment investigations in many disciplines, including botany, zoology, taxonomy, systematics, ecology, microbiology, molecular biology, biochemistry, physiology, toxicology, psychology, and pathology. This is an introductory course to enable students to use this tool in their research, as well as to prepare anyone interested in further study to obtain the HT or HTL certification for a career in histotechnology after completion of their undergraduate degree. Histotechnologists are in great demand in human and veterinary medicine (hospitals and diagnostic laboratories), industry (pharmaceutical and biomedical device development), and academic and applied research.

Course Objectives

The goals of this course are for students to be able to:

Use various criteria to the select techniques to prepare tissues for study by light and electron microscopy;

Know the physics and chemistry behind fixing, processing, and staining different tissue samples for different study objectives;

Prepare tissue samples for examination using light microscopy by hands-on application of protocols, including fixation, processing, paraffin embedding, and staining; and

Collect data from tissue sections and integrate the concepts of histology and histopathology in research.

Due to time constraints, this course will not cover histology (microscopic anatomy, the study of the structure and composition of the cells and tissues as they relate to metabolic function and organismal processes). I teach Histology during fall semesters at GMU (BIOL 465). I recommend that students take Histotechniques after Histology, but it is not a requirement.

Course Expectations

Each 3-hour session will combine lectures, laboratory techniques, or slide reading, but this will vary. We will start by meeting in EXPL 2602, but most sessions will be held in DKH 3060. Sometimes students will rotate among activities as needed, thus permitting more hands-on opportunities with equipment under the instructor's supervision. For example, rotations might occur among (1) self-study of a procedure or preparing an assignment, (2) learning microtomy with another classmate, and (3) participating in sample processing with the instructor, so each person has approximately equal time in each activity each week. The successful student **must read assignments, study supporting materials, and prepare assignments outside of class**. Self-directed study skills are important. Students need to organize material logically and communicate well orally and in writing. **The emphasis will be on understanding the basics.**

Class Preparation

"He who hesitates is lost...."

Reading, research, and assignments are detailed on the following class outlines. Any concerns about keeping up with assignments should be discussed with the instructor prior to class.

Class Participation

Students should be ready to participate in all activities (assignments completed prior to class). **Wear long pants and closed-toe shoes with <u>non-slip</u> soles. I will provide a lab coat and safety glasses or goggles if you don't wear glasses (you can buy your own in the GMU Bookstore in the Johnson Center).** Other personal protective equipment will be provided as needed. Please turn off cell phones or pagers before class begins. **Professional behavior and adherence to the GMU Honor Code are expected.**

Because this class will cover material and procedures that need to be personally experienced to demonstrate proficiency, **absenteeism should be limited to illness or emergencies.** Students should notify the instructor before class whenever possible if they must miss a class. Students will need to work with the instructor to determine whether class activities can be made up later,

although this is likely to be difficult due to schedule conflicts. Students should contact classmates to obtain notes and assignments.

Assignments and Due Dates

Research, writing, problem set, and other assignments and their due dates are detailed on the following class schedule. Please note the following:

> Assignments should be prepared neatly (either hand- or type-written or computer-generated). Be sure to proofread your work to double-check facts, grammar, and spelling; use spell-check if possible. (Sloppily prepared assignments can adversely affect your grade, especially if improvement is not noted during the course).

Missed Exams

Mid-term and final exams will be given. If a student is seriously ill or must miss the test for another reason, notify Dr. Peters and options for completing the test later will be discussed.

Course Textbooks and Materials

Additional notes, reading materials, and problem sets to be completed will be posted on Blackboard during the course. The textbook we will use for the course is:

> Carson, F.L., and C Hladik. 2009. *Histotechnology: A Self-Instructional Text*, 3rd edition. American Society of Clinical Pathologists, Chicago, IL.
>
> A 4th edition, published in 2014, is also available, as is a *Self Assessment Workbook*, 3rd edition, but you do not need this at this time.

These books are expensive, so I have copies in the lab that you can read either in class or at other times and one copy is available in the library for checkout. You may purchase one from Amazon or their other sellers if you wish (if you plan to study histotechnology, this is the book to own). Other books on histology and histotechniques are available in the lab, and additional resources can be obtained from the GMU Library or the Internet. I have posted Peters' Pointers notes to guide your review on Blackboard. The exams are based on Peters' Pointers and lectures.

HistoNet (http://www.histosearch.com/listserver.html) is helpful to learn about all kinds of procedures, ask questions, and obtain more help:

To post a message: Histonet@lists.utsouthwestern.edu
To join and manage your participation: http://lists.utsouthwestern.edu/mailman/listinfo/histonet
To search all old messages: http://www.histosearch.com/histonet.html

The National Society for Histotechnology (www.nsh.org) also offers many resources and now has a question posting/answering service for members (which I can use, if you have a question I can't answer!).

Course Requirements

Students will read textbook chapters, listen to lectures and laboratory instructions, write standard operating procedures, study histoslides to learn about slide preparation quality, and complete two problem sets provided on handouts for solving common histology laboratory calculations.

Students will also participate in preparing tissue samples to make stained histoslides, either provided by the student or instructor. Students will be learning "the ropes," including cleaning glassware, ordering supplies, maintaining laboratory records, logging in and tracking samples, and troubleshooting to correct problems and meet quality criteria. In short, everything they might be required to do when working in a histology laboratory. Students will contribute images, text, and creativity to document the steps in a poster to be prepared for a scientific meeting.

Grading Criteria

The total grade received for this course will be based on the following assignments and assessments:

Activity	Percent Contribution to Total Grade
Class Participation (participate in assigned tasks)	15
Lab Safety Exercise	5
Problem Sets (two, combined grade)	10
Standard Operating Procedure	10
Histoslide Preparation Poster for Meeting	10
Final Laboratory Report	10
Mid-Term Exam	20
Final Exam	20
TOTAL	100

The final grade will be based on this scale:

A+ = 100(+)–98, A = 97–90, A- = 89–88, B+ = 87-86, B = 85–80, B- = 79–78, C+ = 77–76, C = 75–70, C- = 69–68, D = 67–60, F ≤ 60

Honor Code

The GMU code of honor states that **cheating and attempted cheating, plagiarism, lying, and stealing will not be tolerated**. Honor code violations discovered by either students, staff, or faculty will be referred to the Honor Committee. Exams will be completed in the classroom; unless otherwise noted by the instructor prior to the exam, these assessments will be taken without the use of study aids, memoranda, textbooks, other books, data, or other information available. The purpose of these assessments is to evaluate the student's progress in understanding the material.

Histotechniques Assignments and Assessments at a Glance

(Subject to Change)

Week	Date	Assessment or Assignment Due	Lecture or Lab Topics	Assignments for Next Week
1	January 20		We do not meet this week because of the Martin Luther King Day holiday	Blackboard: Peters' Pointers: Histology Basics; Laboratory Safety, Fixation, Post-Fixation Procedures
2 EXPL 2602	January 27		Introduction to the Course What are Histology and Histotechniques Video Tour of Lab	Textbook Chapter 4 on Safety Textbook Chapter 1 on Fixation and pages 38–40 on Decalcification
3 DKH 3060	February 3 Last day to add/drop		Laboratory Safety, Use of Chemicals, Laboratory Basics, SOPs Fixation and Post-Fixation Assigned Tasks	**Lab Safety Assignment** Textbook Chapter 3 on Instrumentation Textbook Chapter 2 on Processing Blackboard: Peters' Pointers: Trim, Process, Embed
4 DKH 3060	February 10	***Lab Safety Assignment***	Lab Problem Solving Tissue Processing and Embedding Assigned Tasks	Textbook Chapter 5- Laboratory Mathematics and Solution Preparation **Problem Set 1**
5 DKH 3060	February 17		Microtomy/Sectioning Assigned Tasks	Blackboard: Peters' Pointers: Microtomy-Immunohistochemistry Textbook Chapter 6- Nuclear and Cytoplasmic Staining
6 DKH	February 24	**Problem Set 1**	Nuclear and Cytoplasmic Staining (H&E)	Blackboard: Read SOP preparation materials and

Week	Date	Assessment or Assignment Due	Lecture or Lab Topics	Assignments for Next Week
3060			Writing SOPs Assigned Tasks	class SOPs
7 **DKH 3060**	March 2		Return and discuss Problem Set 1 Discuss SOPs Slide Quality, QA and QC Assigned Tasks	**Edit WORD VERSION of Harris's H&E SOP in Blackboard SOPs folder to use for Mayer's H&E** **STUDY FOR MID-TERM EXAM**
8	March 9	**SPRING BREAK**	No class	**Finish editing SOP** **STUDY FOR MID-TERM EXAM**
9 **EXPL 2602**	March 16	**Mayer's H&E edited SOP**	***MID-TERM EXAM***	Textbook Chapter 7 Carbohydrates and Amyloid Textbook Chapter 8 Connective Tissue and Muscle
10 **DKH 3060**	March 23		Return graded mid-term exams and Mayer's H&E edited SOP and discuss Histochemical Stains **Begin Poster Preparation**	Textbook Chapter 9 Nerve Textbook Chapter 10 Microorganisms Textbook Chapter 11 Pigments, Minerals, Cytoplasmic Granules **Problem Set 2**
11 **DKH 3060**	March 30		Assigned Tasks (Will work on special stains: Cason's, Giemsa, PAS/AB this and following weeks)	Textbook Chapter 12 Immunohistochemistry Papers: Fluorescent in situ hybridization Work on Poster Preparation
12 **DKH 3060**	April 6	***Draft Lab Activity SOP*** ***Problem Set 2***	Assigned Tasks	

Week	Date	Assessment or Assignment Due	Lecture or Lab Topics	Assignments for Next Week
13 DKH 3060	April 13		Return and discuss Problem Set 2 Discuss Poster Prep Assigned Tasks	Work on Poster Preparation
14 DKH 3060	April 20		Assigned Tasks	Finalize Poster Prepare short **Final Lab Report** on what you have learned this semester
15 EXPL 2602	April 27	***Final Poster***	Review stained histoslides	Finalize Final Lab Report
16 EXPL 2602	May 4	***Final Lab Report***	Review stained histoslides	**STUDY FOR FINAL EXAM**
EXPL 2602	**Monday, May 11** ***FINAL EXAM: All Lectures and Lab Procedures*** **Time:1:30-4:15 PM**			

Notes: