COURSE OUTLINE

LIFS 3220 Animal Physiology Laboratory (Spring 2020)

Tutorial Sessions:	Wednesday	09:30 – 10:20	Rm # 5583 (Lift 29/30)
	Tuesday	13:30 – 14:20	Rm # 4160 (Teaching Lab.)
Practical Sessions:	Tuesday	14:20 – 17:20	Rm # 4160 (Teaching Lab.)

Instructor: Dr. Philip Y. Lam

Course Grading:	**Quizzes**	**12%**
	Laboratory Performance	**12%**
	Proposal, Reports and Worksheets	**28%**
	Written Examination	**48%**

YOU ARE REQUIRED TO ATTEND ALL THE LABORATORY SESSIONS AND SUBMIT ALL LAB ASSIGNMENTS IN ORDER TO COMPLETE THE COURSE.

Phase 1 – Students will work in groups to learn the experimental technique and methods that can be used in investigating various physiological functions in animals. They will be asked to perform experiments following the instruction in the laboratory manual. Every student is also required to submit a written assignment for each of the experiments.

Feb 12	Introduction to LIFS 3220
Feb 19, 25	Practical #1: Muscle Structure and Function
Feb 26, Mar 3	Practical #2: Reflexes & Reaction Times
Mar 4, 10	Practical #3: Cardiovascular Physiology
Mar 11, 17	Practical #4: Respiratory Physiology
Mar 18, 24	Practical #5: Renal Function

Phase 2 – Students will review the knowledge and technique that they have learned from Phase 1. They will work in groups to formulate a project which aims to answer a question that is related to animal physiology. Each group will be required to submit a project proposal and the instructor will review the feasibility of the project and provide feedback. After obtaining approval from the instructor, students will carry out their planned experiments and each group will be required to submit a project report at the end of the semester.

Mar 25	Project proposal submission
Mar 31, Apr 1	Project proposal consultation and feedback
Apr 7 – May 5	Student-initiated project

** Date of the **Written Examination** to be announced by the ARRO.

TEACHING TEAM

Laboratory and Tutorial Instructor

Dr. Philip Y. Lam

Email: ylam@ust.hk

Telephone Ext. 8714

Senior Technician:

Mr. Y.M.Wong

Technician:

Mr. Samuel Cheng

Mr. Rickie Leung

INTRODUCTION

I. Overview of the Animal Physiology Laboratory Sessions

Welcome to the Animal Physiology Laboratory course! Physiology is an experimental science and is best studied with accompanying laboratory sessions. In the laboratory portion of this course, you will learn to handle animals and tissues, as well as set-up and use precision equipment to study physiological phenomena.

Modern physiology requires the use of precision equipment, and knowledge of how to use it is necessary for anyone who anticipates a career in experimental biology. However, the most important and powerful pieces of equipment you have at your disposal, are your eyes, your hands, and your brain; learning how to use these in a laboratory environment is what will make you a good (and perhaps even a great) scientist.

You will be a member of a team of 4-5 individuals and you should communicate well with your group members. It is important that you read the relevant section of this Laboratory Manual BEFORE coming to the laboratory session and devise a plan for carrying out each experiment.

The successful pursuit of scientific objectives almost always involves good organization and teamwork. So work together as a team. Do not rush into experiments before thinking about what you as a team have to do first.

Before each new experiment, there will be a tutorial for the entire class explaining the background principles of each experiment, the expected results and the guideline for lab worksheet/report writing. In addition to the tutorial, a pre-lab introduction will be held before the start of each laboratory session to further explain the practical information about the experiment, students are also required to present their preparation works for the experiment.

You and your team will be assigned to a workstation in the Teaching Laboratory. For each experiment, your workstation will be equipped with the necessary instruments and materials.

One Teaching Assistant (TA) will look after one to two teams in each session. Your TA is there to help you. Be inquisitive. Ask questions. TAs will also evaluate your Laboratory Reports and Laboratory Performance for each experiment.

Your Laboratory Performance in the Animal Physiology Laboratory is an essential component of the Animal Physiology Course. It will count for up to 12% of your overall grade. Apart from the written Laboratory Examination, you will also be continually assessed on the quality of your Laboratory Performance and Reports. Following a Laboratory Session, you will be allowed one week to compile your Laboratory Report. Usually, they will be returned at the next Laboratory Session attended. TAs will grade your lab reports, together with your project proposal and project report, they will count for up to 28% of your overall grade.

Because of the unique nature of doing experiments with living material, a great deal of variability occurs in how much "hard" data is collected from each experiment. The collection of data is NOT the prime objective of the Animal Physiology Laboratory Sessions. The prime objective is to develop your skills as a bench-top scientist.

How you apply yourself in the pursuit of a defined scientific objective (after all, this is what an experiment really is); how you interpret what results you do obtain (even if they are negative ones); and finally, how you report on the experiment undertaken, are the things you will be judged on.

II. Objectives and Course Learning Outcomes of the Animal Physiology Laboratory Sessions

Objectives

This course is aimed to help you to acquire various basic laboratory techniques in physiology, to develop powers of observation and data recording in order to test basic physiological principles. This course also helps you to develop analytical skill and report writing skill by conducting experiments and presenting them in a formal laboratory report format.

As indicated in the course outline, this course consists of two phases. In phase 1, you will work in a group to perform a number of experiments as well as to learn various essential skills and techniques of experimental animal physiology. In phase 2, your group will formulate and prepare your own project proposal as well as carry out your planned experiments. The teaching team will review the feasibility of your proposal and assist you to complete your self-initiated project.

Course Learning Outcomes

Upon completion of this course, students will be able to:

1. Apply various basic laboratory techniques in physiology to handle animals and tissue.
2. Set up and use precision equipment to study physiological phenomena.
3. Critically observe, qualitatively and quantitatively analyze, and apply physiology knowledge to interpret experimental data.
4. Write formal laboratory reports in a scientific paper format.
5. Work and coordinate effectively in a group to accomplish laboratory-based tasks.
6. Operate ethical laboratory practices such as safety and environmental protection.
7. Evaluate and design laboratory experiments, interpret experimental data and write up the results in accordance with appropriate scientific conventions.

III. Course Grading

The grades for this course will be determined as follows:

Assessment Tasks	Contribution to Final Grade (%)	Learning Outcomes to be Assessed
Quizzes	12%	(1), (2), (3) & (7)
Laboratory Performance	12%	(1), (2), (5) & (6)
Proposal, Reports and Assignments	28%	(3), (4) & (7)
Written Examination	48%	(1), (2), (3) & (7)

Attendance

You are required to attend ALL THE LABORATORY SESSIONS in order to complete the course. Proof of legitimate absence must be provided to your instructor and prior permission from your instructor is required to change the laboratory session.

Quizzes

Study the laboratory manual before you come into the laboratory is always a good practice. Good preparation is encouraged and is assessed by quizzes, which are held at the tutorials. The quizzes are on a sudden and random basis and will consist of multiple-choice questions, assessing you on the experimental details and theory of that laboratory session.

Laboratory Performance

During the laboratory sessions, you are required to know clearly what you are doing and why you are doing it, in order to accomplish the task(s) efficiently. Good laboratory performance is encouraged and it will be assessed by your Teaching Assistant (TA). The following is a general guideline of the assessment:

- The marks of lab performance are going to the general performance of all the team members throughout the course. The assessment will be focused on the following areas:
  1. Understanding of tasks listed and motivation to accomplish the tasks;
  2. Presentation of experimental procedures;
  3. Communication with group members;
  4. Timing of experiments;
  5. Analysis/ interpretation of the results obtained and understanding of problems with experiments, if they arise;
  6. Clean up the bench after the experiment.

**Note: *Punctuality* is very important in the laboratory course because if you are late, you not only waste your time but others as well. You will also disturb others when you go into the laboratory after the class begins. Therefore, please arrive at the lab on time. Names of late students will be recorded by TA and marks from laboratory performance will be deducted.

IV. Writing Laboratory and Project Reports

It is essential in science to keep a good record of your experimental results. We would like you to adhere to the following format for writing the laboratory report and project report. Like any piece of scientific research, a laboratory exercise is not finished until the data have been recorded, analyzed, presented and discussed. Your Laboratory Report should follow the basic outline of a scientific paper. This is to develop skills that may prove to be very useful later in your careers.

All laboratory reports must conform to the following format:

1. Title and Author. Give the number and title of the Experiment, your name, your partners' names (i.e., your co-authors of this piece of experimentation), your group no., your session no. and the date of the laboratory session. This is an example for you as reference:

Course code: LIFS 3220
Course name: Animal Physiology
Student name: Chan Siu Ming
Student ID: 20208888
Session/ Group no.: 1
Date of experiment: 12 Feb 20
Experiment #1: Muscle Structure and Function
Group members: xxx, yyy and zzz

2. Introduction. A short paragraph stating the background and objectives of the experimentation.

3. Procedures (or sometimes referred to as Materials and Methods). A reference to your laboratory manual should be sufficient, but any alterations in the procedures laid out in the manual should be carefully detailed. Mention both special problems that arose during the experiments as well as any special precautions that were found necessary to take. **This section should be sufficiently complete to enable someone else to repeat exactly your reported experimental procedures, without repeating your errors.**

4. Results. All observations made during the experimental period and not described in the previous section should be presented in this section. Include "raw" data from your original lab notes, and averaged, calculated or derived data from this raw data. The latter may be in the form of tables or graphs. Always state the units your data is measured in. Traces from the PowerLab/410 recording unit should be included in your report with complete and clear notations. Label them as Fig. 1, Fig. 2, etc for ease of reference

5. Figures: Draw large, well-labeled figures when required. Remember to include a scale bar to provide real dimensions.

6. Discussion: In this section you will discuss your results, explaining the significance of what you have observed, and your conclusions. Try to explain negative findings and comment on sources of error in, and merits of, the procedures used. Draw attention to similarities and differences between your results and those of other researchers. Point out the relevance of your conclusions to the life processes of the animal studied. It is essential to address the questions raised in this Laboratory Manual for each experiment and to consult your course instructors, TAs, texts and reference material, in the preparation of this section.

7. References: If you consult any references during the preparation of your Laboratory Report (something we most certainly encourage!), please use a conventional style for these citations.

***** You are required to use the format listed below for citations in the report and in the reference section:***

I. Citation formats within the text

Examples from Boric et al., 2008 (the Journal of Neuroscience):

- It is widely held that encoding new memories involves adjustments in the strength of connectivity in neural circuits through mechanisms of synaptic plasticity like long-term potentiation (LTP) and long-term depression (LTD) (Bliss and Collingridge, 1993; Bear, 1999)
- Moore et al. (1993) first reported an age-related decrease in LTP at CA1–CA3 synapses…

II. Reference section

Journal article: author(s), year of publication, article title, journal title, volume and page number(s). Examples:

- Bear MF (1999) Homosynaptic long-term depression: a mechanism for memory? Proc Natl Acad Sci U S A 96:9457–9458.
- Bliss TV, Collingridge GL (1993) A synaptic model of memory: long-term potentiation in the hippocampus. Nature 361:31–39.
- Moore CI, Browning MD, Rose GM (1993) Hippocampal plasticity induced by primed burst, but not long-term potentiation, stimulation is impaired in area CA1 of aged Fischer 344 rats. Hippocampus 3:57–66.

Book: author(s), year of publication, book title, edition and publisher. Example:

- Sambrook J, Russel DW (2001) Molecular cloning: a laboratory manual, 3rd Ed. Cold Spring Harbor, NY: Cold Spring Harbor Laboratory.

Chapter in a book: author(s), year of publication, chapter title, book title, editor, page number(s) and publisher. Example:

- Stent GS (1981) Strength and weakness of the genetic approach to the development of the nervous system. In: Studies in developmental neurobiology: essays in honor of Viktor Hamburger (Cowan WM, ed), pp288-321. New York: Oxford UP.

**** Note: The references (in a combination with journal articles, books, etc.) should be listed in alphabetical order of the first author's surname in the "Reference" section.**

V. Guideline On Project Design & Proposal Writing

You must make good use of the principles and technique that you have learnt from Phase I to formulate a project that can answer an interesting question in animal physiology. Prepare your project proposal following the guideline below. The feasibility of the proposal will be reviewed by the instructor and the senior technician. Feedback will be provided during the project proposal consultation and feedback session. You need to obtain approval from the teaching team before starting your project.

Deadline for proposal submission: Mar 25, 2020

Your proposal should include the following:

1. TITLE
   - Your title should give a clear indication of your proposed research approach or key question

2. BACKGROUND AND RATIONALE
   - The background and aim of your proposed research
   - A short review of your research topic that summaries of key debates and developments in the field

3. RESEARCH QUESTION(S)
   - You should formulate these clearly, giving an explanation as to what problems and issues are to be explored and why they are worth exploring

4. RESEARCH METHODOLOGY

You should provide an outline of:
   - The teaching lab resources to be drawn on (**A table to indicate the quantity and the date of use**)
   - The research approach (theoretical framework)
   - The research methods appropriate for the proposed research
   - A discussion of advantages as well as limits of particular approaches and methods

5. PLAN OF WORK & TIME SCHEDULE
   - You should include an outline of the various stages and corresponding timelines for developing and implementing the research, including writing up your thesis.
   - Ideally, your project should be completed within three weeks, with writing up completed in the fourth week.

6. BIBLIOGRAPHY
   - A list of references to key articles and texts discussed within your research proposal
   - A selection of sources appropriate to the proposed research

VI. Academic integrity

- Every report MUST BE your own work. If you have used the ideas of someone else, you should give an in-text citation and a reference list to acknowledge the author(s). YOU MUST NOT COPY from your friends, from the manual, from the lecture notes, from a previously submitted report, from the textbook or from the internet.

- Academic integrity and honesty are key values at HKUST (for details, please visit *http://ugadmin.ust.hk/integrity/student-1.html*). Any student who is found to have committed plagiarism, i.e. presenting work which is not their own and originates from other sources as if it is their own, will receive ***ZERO MARK*** for that lab report.

  If you are found to have committed plagiarism in more than one report, you will receive a "fail" in the course with an X recorded in your transcript.

  Plagiarism includes but is not limited to:
  - *reporting data that is not from your own or your group unless you have specific permission from your instructor to do so;*
  - *using a graph or figure prepared by another student in your lab report;*
  - *asking another student to let you read his or her lab report and then using what he or she has written as the basis for your own report writing;*
  - *working together with a partner on writing the reports, resulting in two identical or very similar reports;*
  - *failing to give credit (a properly formatted citation and reference) for any facts or ideas which are actually not originated from your own;*
  - *making up or adjusting data;*
  - *written description(s) or explanation(s) that are not your own.*

Laboratory report, proposal and project report submission and penalties

Submission dates

- You should submit the "laboratory write up" (reports or worksheets) on the following dates at specified locations.

Phase I assignment	Submission Date / Location
Laboratory Report #1	Mar 3 / Laboratory
Laboratory Worksheet #2	Mar 10 / Laboratory
Laboratory Report #3	Mar 17 / Laboratory
Laboratory Report #4	Mar 24 / Laboratory
Laboratory Report #5	Mar 31 / Laboratory
Phase II assignment	Submission Date / Location
Group proposal	Mar 25 / Collection mailbox
Group project report	May 8 / Collection mailbox

Late submission penalty

- Marks will be deducted for late submissions: ***10% of the final mark per day after the deadline***.

VI. Laboratory Safety

The safety and well-being of everyone involved in the Animal Physiology Laboratory Sessions are of **PARAMOUNT IMPORTANCE**. We will at all times adhere to general University Safety Regulations. To follow, are some additional safety precautions and procedures we will ask you to adopt while participating in the Animal Physiology Laboratory Course.

REMEMBER: IF YOU ARE UNSURE ABOUT ANYTHING, ANY PROCEDURE OR PIECE OF EQUIPMENT, TALK TO YOUR TA OR LABORATORY INSTRUCTOR.

A. General safety precautions and procedures

1. Please arrive on time, since specific laboratory directions and procedures are usually given at the beginning of the laboratory session.

2. Read the experimental details in this manual BEFORE you come to the laboratory to be sure that you understand all the procedures and safety precautions. Ask your TA if you do not understand exactly what has to be done. Do not improvise any procedure.

3. Protective eyewear and laboratory coats must be worn by all students performing or observing experiments.

4. Do not perform any unauthorized experiments.

5. Do not bring any unnecessary items into the laboratory, and do not place any personal items (pocketbooks, bookbags coats, umbrellas etc.) on the laboratory bench, or somewhere someone might trip over them.

6. Make sure all apparatus and equipment is adequately supported and is positioned squarely on the bench.

7. Tie back long hair in order to prevent it getting in the way or caught up in laboratory equipment.

8. Never remove equipment, chemicals, biological materials, or any other material from the laboratory.

9. Do not operate any equipment until you are instructed in its proper use. If you are unsure of the procedures, ask a TA or instructor.

10. Dispose of chemicals, biological materials, used apparatus, and waste materials according to the directions of your instructor. Not all liquids are to be disposed of in the sink.

11. Some exercises in the laboratory (Experiments #3 and #4) are designed to induce some degree of cardiovascular stress. Students should not participate in these exercises if they are pregnant or have hypertension or any other known or suspected condition that might compromise health. If in doubt, before you perform any of these exercises, check with your physician.

12. Do not put anything in your mouth while in the laboratory. Never eat, drink, taste chemicals, lick labels, smoke, or store food in the laboratory.

13. Your instructor will show you the location of emergency equipment such as fire extinguishers, fire blankets, eyewash stations, and first aid kits. Memorize their locations and know how to use them.

14. Wash your hands before leaving the laboratory and remove protective clothing (lab coats, safety glasses, etc.).

B. Precautions related to working with reagents

1. Use extreme care when working with reagents. Should any reagents make contact with your eyes, flush them with water for at least 15 minutes; or, if they make contact with your skin, flush with water for 5 minutes. Notify your TA immediately should a reagent make contact with your eyes or skin and seek immediate medical attention.

2. Report all accidents to your instructor or TA, no matter how minor they appear.

3. The laboratory you are working in should be well ventilated when you are working with chemicals or preserved specimens. Avoid breathing fumes for any extended periods of time.

4. Read the label on any chemicals twice before using it.

5. Replace caps or stoppers on bottles immediately after use.

C. Precautions relating to dissection

1. Rubber gloves should be worn when carrying out dissections.

2. When dissecting, there is always the possibility of skin cuts from dissecting equipment or the specimens themselves, such as the teeth or claws of animals. Should you sustain a cut in this manner, wash your hands with disinfectant soap, notify your TA, and seek immediate medical attention to decrease the possibility of infection. A first aid kit is readily available for your use.

3. When cleaning dissecting instruments, always hold the sharp edges away from you.

4. Dispose of any damaged or worn-out dissecting equipment by giving it to your TA who will place in an appropriate container.