Syllabus: At the Bench - Experimental Physiology  
(Biol-UA 27)

Instructor: Ignatius P. Tan, Ph.D.  
Writing Tutor: Thomas Mawson
Office: 764 Brown  
Email: tlm307@nyu.edu
Phone: 212-998-8295  
Graduate Assistant:
Email: ignatius.tan@nyu.edu

Course Description:
This advanced level course covers three themes in experimental physiology: molecular and cellular systems; nervous and endocrine control of systems; and organ and body systems. The basic structure and function for each system is examined in an experimental setting to show how a particular system contributes to maintaining homeostasis. Through student-designed experiments, the course introduces the technical foundations of experimental design, critical data analysis, and modeling. Professional skills are honed via readings in the current literature, preparing and presenting research talks, and writing formal papers.

Course Hours:
Recitation: Monday 12:30 - 1:15
Lab: Wednesday 12:30 - 3:15

Required Text:
(1) PhysioEX 9.0 for Human Physiology. Laboratory Simulations for Physiology. 2012. By Zao, Stabler, Smith, Peterson, Lokuta. Pearson-Benjamin Cummings Publisher

Optional:
(2) Principles of Animal Physiology. 2006. By Moyes, Schulte. Pearson-Benjamin Cummings Publisher

Objectives of the Course:
1. Introduce students to designing experiments by defining the objectives, understand how to collect the data and analyze the significance of the data in the physiological field
2. Provide the skills to read, present, and write a scientific paper.
3. Students will work with writing fellows to develop the skills and experience in writing science papers.
Course Policy and Grading:
- Recitation and laboratory attendance is required.
- Students are required to submit draft’s of their lab reports and meet with the writing fellow to discuss the submitted draft. This will require extra time outside class hours.
- Late submissions to the Writing Fellows will result in a grade reduction.
- Grade will be based on:
  (a) Class discussion of papers (20%),
  (b) Two project papers (20% each),
  (c) Level and quality of peer reviews (10%),
  (d) Final oral and lab paper (25%),
  (e) Attendance (5%).

Writing Tutors:
- Writing Tutors will work with the students to improve their draft. All students are expected to meet with the Fellows to discuss their writing.
- Writing Tutors are NOT teaching assistants for the class. All grading will be done by the instructor.
- The Handbook on Writing Tutors describes their role in the class:

  What the Writing Tutors Do
  Because Tutors are peer mentors, not graders, they serve as facilitators rather than judges. As peers, they are in a unique position to advise, encourage, and challenge students on the often-sensitive issues found in their own writing. Tutors seek to demystify the conventions of academic discourse and to help their peers advance their aims as writers.

  Some Things that Tutors Don’t Do
  Tutors are not teaching assistants: they address writing issues, not course content. They focus their comments on questions including: Does this draft respond effectively to the assignment? Is the argument, hypothesis, or research question clearly and compellingly set up? Are the readings of data or texts both rigorous and persuasive? Is the paper’s discussion or exposition developed cogently and in a way that shows facility with and knowledge of the discipline’s writing conventions? While Tutors will doubtless engage in spirited discussions about course content during their conferences, they will do so only as interested peers. They keep in mind the writing goals [the Instructor] sets for the assignment as well as what they have learned in their workshops about tutoring. [The Instructor is] alone are responsible for assessing any paper’s content.

  Tutors are also not proofreaders. While the Tutors will identify patterns of grammatical or mechanical error and explain how to avoid them, their main goal is to help their peers become better writers over the long term, not to fix all of the issues in the paper at hand.”
Syllabus:

Week 1:  Skill Building: Reading and Writing Research Papers

Recitation:  None Scheduled

LAB
I. Introduction to Experimental Physiology.
II. Reading a Scientific Research Paper.
III. Guidelines for Writing a Scientific Paper.
IV. Peer -Editing and -Review of Student Papers and Presentations.

Week 2:  Skill Building: Experimental Design and Statistical Analysis

Recitation:  - Review reading assignment and discuss peer review of presentations

LAB
I. Introduction to Science as Conjecture and Refutation.
II. Experimental Design
IV. Introduction to Statistics
IV. Peer Review.

Week 3:  Physiology Project I: Experimental Design for Project I

Recitation:  - Discuss and review systems for Physiology Project I.

LAB
Each group will start to design an experiment that will examine a physiological system (from the list below) that will also encompass two areas of control, (1) molecular and cellular level and (2) nervous and endocrine control.

Physiological Systems for Project I:  A. Cardiovascular System.
B. Exercise Physiology.
C. Respiratory System.
D. Muscle Physiology.

Computer Simulations for Project I:  Students will use computer simulations to help design their experiments.
A. Cardiovascular System:  Exercise # 6.
B. Exercise Physiology: Exercise # 5.
C. Respiratory System: Exercise # 7.
D. Muscle Physiology: Exercise # 2.

When students design their projects, the following objectives can be asked by students and used to understand topics in: Muscle Physiology, Cardio-Respiratory System, and Exercise Physiology:

I. Muscle Contraction and Muscle Type:
   A. Microscopic examination of cellular and molecular components
      - Understand the importance and function of fast vs. slow type of muscle cells.
      - Demonstrate the relationship in the cellular respiratory pathways between oxidative versus glycolytic capability of the cells.
      - Histology of skeletal, cardiac, and smooth muscle.

II. Human Movements as measured via an electromyograph (EMG).
    A. Introduction to EMG and developing experiments
       - How does the EMG work?
       - Formulation of hypothesis.
    B. Experiments to understand how muscles are controlled.
       - Difference between voluntary and involuntary control.

III. Regulation of the Cardio-Respiratory System during Exercise.
    A. Effects of CO₂ and O₂ on the respiratory and cardiovascular system.
       - Measure CO₂ production
       - Measure respiratory volumes and heart rate
       - Measure heart rate, blood pressure
    B. Coordination of respiration and heart rate.
    C. Estimate oxygen consumption.
       - Determination of Oxygen dissociation and affinity curves.

IV. Data Analysis.
    A. Understand the stages of data analysis which includes compilation of raw data into tables, figures, histogram, and statistical analysis

Week 4: Physiology Project I: Peer Review and Redesign of Project I.

Recitation: - Discuss peer review of student projects.

LAB
I. Discussion and peer-review of groups experimental proposal.
II. Refine and submit a revised proposal before the next class.

Week 5: Physiology Project I: Student Experimentation - Part 1.

President’s Day No Recitation
LAB
I. Student perform their experiments

Week 6: Physiology Project I: Student Experimentation - Part 2.

Recitation: - Guest Lecturer: Brian Schwartz
- Discuss and review systems for Physiology Project II.

LAB
I. Continuation of student project.

Week 7: Physiology Project I: Student Presentation of Project I.

Recitation: - Discuss peer-review results of student presentations.
- Discuss and review systems for Physiology Project II continued.
- Discuss student submitted Project I Paper.

LAB
I. Peer review of student presentation.
II. Draft of Project I lab paper due.

-- Std meet with Writing Fellow
- Final copy of Project I due on 3/30

Week 8: Spring Break 3/12 - 3/15

Week 9: Physiology Project II: Experimental Design for Project II.

Recitation: - Discuss and review systems for Physiology Project II continued.

LAB
Each group will start to design their second experiment that will examine a different physiological system (from the list below) that will now encompass three areas of control, (1) molecular and cellular level, (2) nervous and endocrine control, and (3) overlap of different systems.

Physiological Systems for Project I: A. Digestive System.
B. Renal System Physiology.
C. Metabolism and Homeostasis.
D. Neuro-Biology.

Computer Simulations for Project I: Students will use computer simulations to help design their experiments.

A. Digestive System: Exercise # 8.
B. Renal System Physiology: Exercise # 9.
C. Metabolism and Homeostasis: Exercise # 10, 11.
D. Neuro-Biology: Exercise # 3.

Week 10: Physiology Project II: Peer Review and Redesign of Project II.

Recitation: - Discuss project II.

LAB
I. Discussion and peer-review of groups experimental proposal.
II. Refine and submit a revised proposal before the next class.
III. Final copy of Project I lab paper Due

Week 11: Physiology Project II: Student Experimentation Part 1.

Recitation: - Discuss student’s final paper.

LAB
I. Students perform their experiments

Week 12: Physiology Project II: Student Experimentation Part 2.

Recitation: Guest Lecturer: Brian Schwartz.

LAB
I. Continuation of student project.

Week 13: Physiology Project II: Student Presentation of Project 2.

Recitation: Discuss peer review results of student presentation # 2.

LAB
I. Peer review of student presentation.
II. Draft of Project II lab paper due.
- Stds meet with Writing Fellow
- Final copy of Project I due on 5/4

**Week 14: Final Oral Presentation: TBD**

Recitation: Open schedule.

LAB
I. Students will give a final presentation with question asked by the audience.

**Week 15: Final Oral Presentation.**

Recitation: None scheduled.

LAB
I. Students will give a final presentation with question asked by the audience.
II. Final copy of Project II lab paper Due