

# APPH 6240 Syllabus

Cellular Physiology & Adaptation, 3 credit hours

Fall 2026

## Instructor Information

**Instructor:**

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## General Information

### Description

Physiology is the branch of biology that aims to understand the mechanisms of living things, from the basis of cell function at molecular level to the integrated function of the organism. This course will focus on the cellular basis of physiological function. Topics covered will include, but will not be limited to cell signaling, solute transport, osmoregulation, acid-base balance and energetics. The last section of the course will focus on how cells, in particular muscle cells, respond and adapt to maintain homeostasis when challenged with altered metabolic demand.

### Learning Objectives:

- Understand the physiological regulation of gene expression, protein synthesis and degradation.
- Understand how the major sources of metabolic energy are utilized and stored.
- Understand the transport of solutes into and out of cells
- Understand how solute transport regulates cell volume and acid base balance.
- Understand the generation of the membrane potential and how that potential is utilized by non-excitabile cells.
- Understand how these systems respond and adapt to homeostatic challenges.
- Understand how aging alters the responds to homeostatic challenges.

## Course Requirements & Grading

### Assignments and Weight

- Mid-Term Exam - 25%
- Final Exam - 25%
- Homework - 15%
- Oral Presentation - 15%
- Research Article Critique - 20%

### Description of Graded Components

The mid-term exam will be given during a regular class period and will cover material from the first half of the semester. The format will be short answer and essay questions. It will test recall knowledge as well as your ability to synthesize the material and apply it to novel contexts.

The final exam will be given during the final exam period. The format will be the same as the mid-term exam and will only address material from the second half of the course.

Research Article Critique: The goals of article critique are to foster critical analysis of the scientific literature and promote effective written communication. The paper should be 7-10 double spaced pages including references. Students will choose an original research article from a reputable peer-reviewed journal and get approval for the paper from Dr Balog no later than September 22. The topic of the journal article should focus on a physiological mechanism, be broadly related to an area covered in class but unrelated to your area of research. The critique should begin with a brief review of the literature leading to the reason why the work described in the article was performed and the hypothesis. The review of the literature will require that you read articles in addition to the one you will analyze. Included these articles in your references. The critique should also include a summary of the methods, results and the author's interpretation and conclusion. Your critique should include a discussion of whether the problem was significant, whether the experimental design and methods appropriate, do you agree with the author's interpretation of the results, is the work likely to have a significant impact on the field, what (if anything) would you have done differently and what should be done next.

Paper Presentations: Students will be assigned a recent research article. The presentation will be limited to 15-20 minutes. The presentation should be similar to a journal club presentation. Your talk should provide a brief introduction to the problem addressed in the paper, a description of the methods and results. Describe the author's conclusions and state whether you agree with them and why or why not. Point out any improvements that could be made in the experimental design, methods, results and/or interpretation. Make sure to address the significance of the work and what questions remain. The class will be required to read and comment on all papers!

## Grading Scale

Your final grade will be assigned as a letter grade according to the following scale:

A	90-100%
B	80-89%
C	70-79%
D	60-69%
F	0-59%

## Course Materials

**Required textbook: None; online resources will be linked in Canvas.**

Online text:

Albert, B et. al. Molecular Biology of The Cell, Fourth Edition, 2002 at the National Library of Medicine. <https://www.ncbi.nlm.nih.gov/books/NBK21054/>

Supplemental textbooks:

Albert, B et. al. Molecular Biology of The Cell, W.W. Norton & Company, Seventh Edition, 2022.

Boron, W.F. and Boulpaep, E.L. Medical Physiology, Elsevier, Third Edition, 2017.

**Required Software:** Two free software programs, *Electrophysiology of the Neuron* and *ChimeraX* will be used for class homework.

Download *Electrophysiology of the Neuron* at: <https://www.eotnprogram.org/>

Download *ChimeraX* at: <https://www.rbvi.ucsf.edu/chimerax/>

## **Course Website and Other Classroom Management Tools**

All course assignments, readings and grades will be posted and submitted via Canvas.

## **Course Expectations & Guidelines**

### **Academic Integrity**

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. For information on Georgia Tech's Academic Honor Code, please visit <http://www.catalog.gatech.edu/rules/18/>.

Any student suspected of cheating or plagiarizing on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

### **Attendance**

Attendance will not be recorded however, it is vital for learning and active participation is critical for successful completion of the class.

### **Extensions, Late Assignments, & Re-Scheduled/Missed Exams**

Rescheduling an exam must be done in advance and receive approval from the instructor. An exam missed without prior approval will receive a zero.

### **Use of Generative AI (Artificial Intelligence) for Class Work**

The use of AI-based assistance such as ChatGPT, will be considered the same as a collaboration with another person. You are encouraged to discuss your ideas and work with other people as well as AI-assistants. However, all work you submit must be your own. Never include in a submitted assignment anything that was not written directly by you without giving the proper citations.

### **Accommodations for Students with Disabilities**

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services at (404) 894-2563 or <http://disabilityservices.gatech.edu/>, as soon as possible, to make an appointment to discuss your special needs and to obtain an accommodations letter.

### **Student-Faculty Expectations Agreement**

At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. See <http://www.catalog.gatech.edu/rules/22/> for an articulation of some basic expectation that you can have of me and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.