

PHYS 2211C – Intro Physics of Living Systems I

The main goal of this course is to have you engage in a process central to science: **modeling a broad range of physical phenomena using a small set of powerful fundamental principles, focusing on examples from living systems.**

This is not your parents' physics! This class will focus on the physics relevant to living things from molecules to worms to woodpeckers. While physics, chemistry, and biology are well-established fields, some of the scientific questions you will explore in this class have only recently been tackled. You will focus on physics at the convergence with biology, where physical, chemical and biological principles all come into play. A primary theme for this first semester is the concept of motion -- and the difference between coherent, directed motion and the random motion that occurs at the molecular level.

Topics include:

- Rates of change, velocity, acceleration, and momentum
- Newton's laws of motion
- Spring and normal forces
- Gravitational forces
- Electrostatic forces and fields
- Random motion and diffusion
- Fluid flow, buoyancy, tension, and pressure
- Work, potential energy, and chemical energy
- Conservation of energy
- Heat and temperature

By the end of the course, you will be able to:

- Apply a small set of fundamental physical principles to a wide variety of biological situations.
- Use these principles to explain a wide variety of physical phenomena.
- Model physical systems: make idealizations, simplifying assumptions, estimates.
- Appreciate the role of physical laws in biological systems and be able to give examples.
- Solve complex, multi-step and multi-concept problems

Textbook:

Instead of a traditional textbook, we will be referencing an online wiki, carefully developed and constantly improved by physicists at the University of Maryland:

[http://umdb.org.pbworks.com/w/page/90716129/Working%20content%20I%20\(2015\)](http://umdb.org.pbworks.com/w/page/90716129/Working%20content%20I%20(2015))

Evaluation

Numerical ranges for final grades are as follows: 90-100 points = A, 80-89 points = B, 70-79 points = C, 60-69 points = D, 0-59 points = F. Final grades will not be curved:

The Core Points – 90 points of required work for all students

45pts - Evening Tests: There are four evening tests weighted from your lowest to highest test score (6pts, 9pts, 12pts, 18pts). The dates for these tests are listed on the course schedule.

- The format is a combination of multiple choice and free response
- Closed book except for a formula sheet (provided with your test)
- Arrangements will be made for ADAPTS students on a per-person basis – please consult with Dr. Curtis.

25pts - Final Exam: Your final exam will be Friday, Dec. 9 from 8-10:50 AM.

20pts - Laboratory: Lab begins the **first** week of class, please bring your laptop with you to lab.

- You must attend the lab section for which you are registered in order to receive credit.
- Only those with a VALID WRITTEN EXCUSE for missing a lab will be allowed to do a makeup activity at the end of the semester. That activity will take at least two hours and may involve doing another lab or evaluating data.
- Lab exercises will account for 15pts of your final grade in the course and may include group problems or experiments.
- Many labs will have an associated individual **pre-lab** assignment on WebAssign to be completed before lab. All labs will have graded team **write-ups** to be turned in after lab. These combine to account for 15 of the 20 lab points in the course.
- At the start of most lab sections, students will have 25 minutes to complete a lab **quiz**. Your lab quizzes will account for 5 of the 20 lab points in the course.

The Bucket Points – Earn 10 points from any combination of these activities

5pts - Homework: Accessed by logging into T-Square and clicking on the WebAssign link

- Homework is due every Sunday evening. Correct submissions submitted more than 48 hours before the deadline earn a 40% bonus. Homework scores greater than 100% will count as extra credit. For example, correct homework always submitted early would earn 2pts of extra credit on the final course grade.

3pts - Participation: Class participation is monitored through a series of in-class polling-type questions.

- Each student will need to purchase a Turning Technologies ResponseCard or ResponseWare license (for use with the mobile app). More info on this system is given

here: <http://www.ctl.gatech.edu/faculty/technology/clickers>

1pt - Optional Assignments: Additional physics problems will be posted for each chapter and are due before each test.

1pt – Seminar Reviews: After attending one of the pre-selected seminars, submit to weassign either (A) a short video review or (B) a half-page written review. In your review, do not just summarize but also give your own observations on the work and how it may connect with the class. Attend and review three seminars for the full 1 point. A listing of available seminars will be posted to the course webpage; if you want to attend a seminar not listed, please ask Dr. Curtis for approval first.

2pts - Reading Assignments: A few questions on the reading assignments are due at midnight on the day before each class. No partial credit will be given; each assignment is graded all-or-nothing.

2pts – Create and solve real-world problems: Identify examples and problems in biology where physics principles are relevant. For each problem you identify, write up an approved solution using the concepts learned in this course. You will receive 0.5 pts per problem, up to a maximum of 4 problems (2 pts). The problems should go beyond a “plug-and-chug” textbook-like problem with a trivial result. It should be challenging but solvable by a well-prepared student. The problem and solution must be clearly written (free of spelling and grammatical errors) and the values used must be physically plausible. Improve your grade while deepening the biological context of the course at the same time!

Guidelines

Honor

- The policy on academic honesty as stated in the Honor Code will be fully enforced during this course for both the instructor, Dr. Curtis, and for the student:
<http://www.honor.gatech.edu>
- Collaboration with other students in this course on homework assignments and in-class activities is permitted and encouraged. However, when done studying, you should be capable of fully doing all work on your own.
- Students are not permitted to use a second WebAssign account.
- Collaboration is not permitted on lab quizzes, tests, or the final exam.
- Students are not permitted to use another student's Clicker in lecture. It is an Honor Code Violation to submit responses for another student using their clicker.
- Honor code violations will be referred to the Dean of Students office.

Testing

- If you are more than 15 minutes late for an evening test or final exam, you will not be permitted to participate.
- If you are an ADAPTS student please contact the Dr. Curtis immediately to discuss your accommodation.
- If you feel that an error has been made in the grading of test, you will have until the start of the next test to submit your test for regrade to a graduate TA who will consult with Dr. Curtis.
 - If you are unable to meet with a graduate TA, please meet with Dr. Curtis.

Absences

- Students may be excused from core course work (exams or labs) ONLY if they:
 - Participated in an approved Institute activity (e.g. athletics, conferences, etc.); were required to appear in court; were suffering from a serious illness that required a doctors visit; experienced the death of an immediate family member; observed a religious holiday.
 - There are no makeup quizzes or tests; you can only be excused from these assignments.
 - If you are excused from an evening test, your final exam grade will replace your missing test grade at the end of the term. Experience has shown this to be more beneficial for the student than giving a makeup test.
 - Please visit Dr. Curtis's office hours with documentation within one week of

returning to campus.

- Missed course activities from the bucket cannot be excused. Instead, students should complete additional bucket activities to make up for the missed work. No documentation is required but please contact Dr. Curtis if you have questions or concerns.

Participation

- The secret to succeeding in this course is to actively participate in class, in labs, and on Piazza.
- Lectures meet Monday, Wednesday and Friday. Lectures are important because they give you the opportunity to ask questions, clear up points of confusion, and practice solving problems that emphasize key concepts.
 - You will be responsible for taking your own notes. <http://goo.gl/xdKdrZ>
 - Each student must register the DeviceID for their ResponseCard, located on the back of their unit, through T-Square, by clicking on the left menu item “*Course Tools>Clickers*”
 - ***This is true even if you are using the ResponseWare app on your cell phone***
- Keep up with the suggested reading for each lecture listed on the course schedule
- After studying the wiki sections, work through the WebAssign homework questions to check your understanding on your own. While you may work in a small group, you are encouraged to work many of the problems on your own, which better reflects testing conditions.

WebAssign

- Coursework is completed using the WebAssign online homework system.
 - Accessed through T-Square by clicking on the left menu item “*Course Tools>WebAssign*”
 - Access has already been purchased using a portion of your lab fee.
 - Your overall grade for the course will also be visible here.
- You are given 10 submissions for each question part within an assignment.
 - After the third submission you incur a 5% penalty for that question part.
- Extension requests for an individual assignment will be handled automatically by the WebAssign system with a 10% point penalty.
 - You are allowed a maximum of **two** extensions per assignment.
 - You must **request** an extension within 48 hours of the original due date.
 - Once you request an extension, you must **complete** it within 12 hours.

Getting Help

- Dr. Curtis is available to discuss physics related problems during office hours, which are to-be-determined (TBD).
- The two graduate TAs, Curtis Balusek and Hema Selvakumar, will hold office hours in the Dept. of Physics “Interaction Zone” in Howey S105 (next to the Main Office). Hours are TBD and will be announced in class.
 - **NOTE:** Do **NOT** go to the Physics Help Desk in Clough Commons – the TAs for other sections of 2211 are not prepared to assist with 2211C.
- Any issue related to the administration of the course should be directed to Dr. Curtis.
- **You can request online help from students, TAs and instructors through Piazza**
 - *Accessed through T-Square by clicking on the left menu item “Course Tools>Piazza”*