PHYS 2211-LS Syllabus

Introductory Physics of Living Systems (IPLS) I, PHYS 2211 Section LS, 4 credits

Fall 2026

Instructor Information

Instructor and Course Coordinator: Nicholas Darnton
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General Course Information

Description

The IPLS sequence focuses on the physics relevant to living things, on scales from molecules to bacteria to mammals. The unifying theme of the first semester is *motion*, including the difference between coherent, directed motion and the random motion that occurs at the molecular level.

- Kinematics and the relationship between position, velocity and acceleration
- Constant acceleration kinematics and circular motion.
- Newton's laws of motion.
- Forces, including gravity, tension, the normal force, friction, springs, and drag.
- Momentum and collisions.
- Random motion and diffusion
- Hydrodynamics, including fluid flow, buoyancy, and pressure
- Energy, including work, potential energy, and conservation of energy
- Simple harmonic motion
- Waves

Course Learning Outcomes

Upon successful completion of this course, you should 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

Required Course Materials

Our main text is University Physics for Life Sciences by Randall Knight, published by Pearson. We occasionally supplement it with an online wiki from the University of Maryland. *Free access to the Knight ebook is provided*.

Grading Policy:

Standard 10-point letter scale (A: 90-100; B: 80-90; C: 70-80; D: 60-70; F: below 60) based on:

- Three midterms exams: total of 45 points
- Final exam: 25 points
- Lab experiments: 10 points
- Lab quizzes: 5 points
- Lab attendance, peer reviews and prelab assignments: 3 points
- Bucket points: a maximum of 12 points from
    - Online homework: 6 points
    - Written homework: 4 points
    - Lecture participation: 4 points
    - Seminar reviews: 2 points

Description of Graded Components

- Midterms and final exam: in-person, on paper, closed-book but with a supplied formula sheet. Their format is 25% multiple choice / short answer and 75% long-form free response. Approximately every 4 -5 weeks.
- Lab experiments: most lab writeup are group (3- or 4-person) assignments, completed and submitted during lab. Approximately weekly.
- Lab quizzes: single short free-response questions done during lab. Approximately biweekly.
- Online homework: submitted through MasteringPhysics. Weekly.
- Written homework: one or two long-form questions. Weekly.
- Lecture participation: Evaluated through clicker response data. Each lecture.
- Seminar reviews: Analysis of a live or in-person lecture from curated list. Four per semester, due at mid-semester and end of semester.

Course Policies

Attendance and/or Participation

In-person attendance of lectures is expected and evaluated through clicker response data. In-person attendance of labs is *required*. Unexcused absence from more than two labs will result in failure regardless of completion of other course components.

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. Review Georgia Tech's Honor Code and the student Code of Conduct.

Any student suspected of cheating or plagiarism 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.

Core IMPACTS

Physics courses at Georgia Tech are governed by the following system-wide components:

- **Orienting Question:** "How do I ask scientific questions or use data, mathematics or technology to understand the universe?"
- **Learning Outcome:** Students will use the scientific method and laboratory procedures, or mathematical and computational methods, to analyze data, solve problems, and explain natural phenomena.
- **Career-Ready Competencies:**
- **Inquiry and Analysis:** Developing the ability to investigate complex questions systematically.
- **Problem-Solving:** Applying physical principles to find solutions for technical and natural challenges.
- **Teamwork:** Working collaboratively during laboratory exercises and group projects.

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services (404-894-2563) as soon as possible to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

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. The Student-Faculty Expectations articulate some basic expectations 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.

Pre- &/or Co-Requisites

Prerequisite with concurrency: MATH 1552 (Integral Calculus).

Collaboration, Group Work, and Use of Generative AI

Collaboration is encouraged on recitations, problem sets (written and online), clicker questions, and lab writeups. With the exception of lab writeups, which are usually completed as a group with a single group submission, you are responsible for the actual completion and submission of your own work. You may (and probably should) work with peers to *understand* the material, but the actual finished product that you turn in must be your own words and calculations. That is, you can work together figure out *how* to solve something, but *what* you turn in must be your own personal product. AI may be used as a tool for understanding material (with caution!) but all submitted material must be the student's own words.

Collaboration is forbidden on quizzes, tests and on the final exam.

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

- Written homework: no extensions.
- Experimental writeups: no extensions. A single makeup experiment is available for institutionally excused absence *only*. Students must complete both weeks of two-week experiments to earn credit.
- Online homework: no extensions but can be submitted late with penalty.
- Quizzes: no makeup quizzes. With advance notice you can typically attend another lab section. Missed quizzes can be excused with institutional approval.
- Exams: Makeup exams are offered for documented institutionally excused absences. If this is not possible, the final exam score is substituted for the missed exam grade.

Inclement Weather and Digital Learning Days

All lectures are recorded over Zoom. In exigent circumstances you can occasionally, with prior permissions, participate remotely. During campus closure lectures will be conducted remotely. Labs are inherently in-person and cannot be completed remotely.

Student Use of Mobile Devices in the Classroom

Please limit your use of computers and mobile devices to course-related activities, such as answering clicker questions using a phone app. If phone and/or computer use becomes distracting to others, we reserve the right to move computer users to the back of the lecture room where they will not distract students behind them.

Additional Course Policies

See the course Canvas web site for additional information about grading, course components, weekly pacing, due dates for all assignments, and exam structure. In case of conflict, Canvas supersedes this syllabus.

Campus Resources for Students

Undergraduate Student Academic Success Resources:

- Academic Support: Academic Success and Advising (a unit in the Office of Undergraduate Education & Student Success) provides free support for your courses. Students can attend scheduled supplemental review (PLUS) sessions, stop by Drop-In Tutoring, or schedule a one-on-one appointment through Knack. To explore what options work best for you, please visit us online at success.gatech.edu/tutoring, email us at tutoring@gatech.edu, or come see us at Clough Undergraduate Learning Commons, Suite 283.

Student Well-Being:

At Georgia Tech, we are concerned about your overall physical, social, and mental well-being. A comprehensive list of wellness related resources has been compiled and maintained by the Office of the Vice President for Student Engagement and Well-being (student-resource-guide (gatech.edu)