

PHY 317K General Physics I

87705

Summer 2022

I am happy to have you in this class and I look forward to helping you with your learning. My priority is to help you have a positive learning experience. To that end, please let me know if there is anything that I can do to improve your learning. By enrolling in the course, you agree to the structure and policies discussed in this syllabus. This syllabus may be updated to improve the course.

Instructional Team

INSTRUCTOR

Dr. Viranga Perera (he/him)

Email:

Office: PMA 12.328

I encourage you to talk to me one-on-one about anything related to the course by scheduling an appointment with me using Microsoft Bookings

TEACHING ASSISTANTS

Course Description

In this **fully-online asynchronous** course, we will use calculus and statistics to study fundamental principles of mechanics, heat, and sound with a specific focus on applications in the life sciences. This course is designed and recommended primarily for premedical students and students in the life sciences. This course satisfies most medical and dental school requirements for physics. The course will primarily take place on Canvas (utexas.instructure.com), where you will find the course organized by daily modules.

EXPECTATIONS

Being that this a summer course, it will be fast paced since we are trying to cover material in about 5 weeks that would typically be covered over a 14-week academic semester. This course has been designed as a series of Canvas modules to guide you through the material in an organized way and at a pace which spreads your learning across this compressed course. As you have enrolled in this course, you have taken on the responsibility of keeping up with the coursework. This is particularly important given that this course is fully-online and asynchronous. You are responsible for keeping up with the coursework each day and to communicate with the instructional team if you run into any difficulties with the course. Of course, being asynchronous there is some flexibility as to when you complete course tasks, but kindly do not put off doing the coursework for several days in a row.

PRE-REQUISITES

Credit with a grade of at least C- in Mathematics 408C or 408R; or credit with a grade of at least C- in 408K or 408N and registration for 408L or 408S; and credit with a grade of at least C- or registration for Physics 117M.

LEARNING OUTCOMES

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

1. Connect physics principles to life science applications
2. Relate a given physics problem to one or more fundamental physics principles/laws
3. Write fundamental physics principles/laws in equation form in the context of a particular problem
4. Solve physics equations using calculus and/or statistics to find a desired parameter
5. Translate a new problem/situation in nature into a physics problem
6. Work with different people in an online environment to learn and solve problems using physics

COURSE FLAGS

This course carries the Quantitative Reasoning flag. Quantitative Reasoning courses are designed to equip you with skills that are necessary for understanding the types of quantitative arguments you will regularly encounter in your adult and professional life. You should therefore expect a substantial portion of your grade to come from your use of quantitative skills to analyze real-world problems.

Course Communication

All communication in this course is expected to remain respectful.

COURSE ANNOUNCEMENTS

I will be sending out periodic course announcements via Canvas. It is your responsibility to ensure that you receive course announcements via a current email address listed within Canvas.

ED DISCUSSION

If you have a question about the course, use Ed Discussion (see the tab on Canvas) to post a question. Since several hundred students are enrolled in this course, Ed Discussion is a good place to post questions since others may also benefit from knowing the answer to your question. Both the instructional team and students can post and answer questions on Ed Discussion.

EMAIL

If you have an individual question, you can email the instructional team. That account is checked frequently by the instructor and the TAs. Thus, it is the best email to reach us.

CANVAS MESSAGES

Do not use the messaging feature that is built into Canvas. It makes it difficult to track messages. Instead use either Ed Discussion or the email address for the instructional team.

Course Material

TEXTBOOK

We will be using the pre-print of an upcoming textbook called *Introductory Physics for the Life Sciences: Principles and Authentic Applications* by Simon Mochrie and Claudia De Grandi. The authors have kindly allowed us to use the PDF of the textbook for free this summer. Since this is a new textbook, I encourage you to use the free OpenStax physics textbooks to supplement your reading if you feel the need for additional context for the topics. I will point to relevant sections of [Volume 1](#) and [Volume 2](#) of the OpenStax physics books within Canvas.

QUEST

You will do your homework assignments and exams on Quest (the question server maintained by the College of Natural Sciences at UT Austin). The cost of the service is \$25, which goes towards the maintenance and operation of Quest. Please go to <https://quest.cns.utexas.edu> to log into the system. Around the second week of class, you will be asked to pay the \$25 fee. Note that you have the option of waiting up to 15 days to pay while continuing to use Quest for your assignments. If you are taking more than one course using Quest, you will not be charged more than \$50 per semester.

TECHNICAL

All students are required to have access to a [laptop](#) or [desktop computer](#), running either Windows or macOS operating systems. Tablets, smartphones, and Microsoft Surface devices are not supported. Your computer should meet the following requirements:

- Modern and up-to-date operating system (macOS or Windows)
- Browser: Chrome (highly recommended), Safari or Firefox. If using Safari or Firefox, be prepared to [download Chrome](#) and use it.
- Internet connection speed: 5 Mbps download speed. [Check your speed here](#).
- Functional webcam and microphone
- Zoom installed and configured

Confirm that your computer is able to stream video by visiting <https://www.laits.utexas.edu/tower/tech.php>

For the best experience:

- Close all unnecessary browser windows and tabs and programs:
 - Streaming music (Pandora, Spotify, etc.)
 - Social media sites
 - YouTube or other video sites
 - Online/Offline Gaming
- Check your computer is free of viruses, malware, and spyware ([UT recommendations](#))
- Clear the browser's cache before class ([here's how](#))

If you [experience a technical problem](#), click on the “Online Course Tech Support” item in the left-side navigation bar. The Online Course Tech Support chatbot, called “LAITS Bot,” will assist with technical problems and can escalate your question to a human if it cannot readily answer your question.

Course Structure & Grading

READINGS (10%)

You will be assigned sections of the textbook to read for each day of class. Textbook readings will be done using Perusall, which you will access within Canvas. For each reading assignment, you are expected to make at least two annotations (highlight and write about a part of the text that you found particularly interesting, confusing, etc.) to get the maximum of 2 points for that assignment. Perusall is a tool that can enhance your learning process by making course readings more interactive (e.g., you can view what other students thought and respond to their comments). You can miss up to three days of Perusall readings and still obtain full points towards this part of your final course grade. Please do not go to the Perusall website directly as it will create a different user account for you resulting in you not getting credit.

LECTURES (15%)

For each day of the course, you have one or more video lectures to watch. To get full credit (2 points) for each day, you will need to watch each lecture video (1 point) and participate in a conversation within Ed Discussion (1 point). For a given day, make at least one meaningful comment (e.g., connect the reading to a previous class) or pose a question (e.g., asking how the textbook derived an equation) to get full credit.

HOMEWORK (25%)

You will complete two homework assignments each week (**due at 11 pm [CDT] on Sundays and Wednesdays**), which you will primarily complete on Quest. The goal of working through homework assignments is for you to actively learn course material by trying to do problems based on the ideas discussed in the readings and lectures. I encourage you to talk to the instructional team and collaborate with your classmates as you complete the homework, but you are responsible for learning and understanding the material covered. Do not just copy what someone else did just so that you complete the assignments. Use the homework as check on your own understanding. If you have any questions about what is and what is not acceptable in terms of collaboration, using resources, etc., please ask. Solutions to the homework will be available 2 hours after the deadline on Quest. I will automatically drop your two lowest homework grades. It is best that you try to do well on all homework assignments as this drop policy is meant for contingencies. If you need to miss homework assignments, you can use the two drops since it will not affect your grade. If you need to miss more than three homework assignments, then you need to have a note from the Student Emergency Services to make up the homework.

MIDTERM EXAMS (25%)

Midterm exams are opportunities for you to demonstrate your understanding of the course material. You will have two midterm exams covering material just prior to the particular midterm (i.e., midterms are not comprehensive). The midterm exams will take place through Quest on **June 13th** and **June 27th**. For each exam, you will complete the approximately 1-hour exam **between 3 pm and 9 pm (CDT)** on the days of the scheduled midterm exams (at your convenience). You are required to take the midterm exams individually. When taking the exams, you may have one (front and back) handwritten notes sheet on letter paper, a programmable calculator, and scratch paper.

No books or any online resources are allowed. You will need to have your webcam turned on and directed at you, so that the Quest system can take periodic images of you taking midterm exams. You will additionally need to turn in your work (on scratch paper) by scanning your documents into Canvas. I will drop your lowest midterm score. After dropping your lowest midterm, if your final exam score exceeds the lowest remaining test score, your final exam score will replace that lowest score. It is best that you try to do well on all midterms as these drop policies are meant for contingencies. If you need to miss a midterm for any reason, you can use the one drop since it will not affect your grade. If you need to miss both midterms, then you need to have a note from the Student Emergency Services to make up the second midterm.

FINAL EXAM (25%)

The final exam is an opportunity for you to demonstrate your comprehensive understanding of the course material. Your final exam will take place through Quest on **Friday, July 8th**. You will complete the approximately 2-hour final exam **between 3 pm and 9 pm (CDT)**. You are required to take the final exam individually. When taking the final exam, you may have two (front and back) handwritten notes sheets on letter paper, a programmable calculator, and scratch paper. No books or any online resources are allowed. You will need to have your webcam turned on and directed at you, so that the Quest system can take periodic images of you taking the final exam. You will additionally need to turn in your work (on scratch paper) by scanning your documents into Canvas. The final exam is required and must be taken at the time designated.

GRADE BREAKS

Grade	Cutoff
A	94%
A-	90%
B+	87%
B	84%
B-	80%
C+	77%
C	74%
C-	70%
D+	67%
D	64%
D-	60%
F	<60%

Your course grade will be rounded to the nearest whole percentage. I will not be grading on a curve. As such, it is possible and highly encouraged for everyone to earn an A by demonstrating your learning.

Learning

HOW LEARNING WORKS

An aspect of learning is changing how we think and behave in response to new information. Our brain does not just accept new information like a computer. Instead, our brain processes new information in relation to what it already knows and tries to fit new information to old information. To help with this process, I suggest actively trying to connect what you learn to what you already know and to ask yourself if the old and the new information are consistent. Overall, I want you to know that it is ok to not know something and to make mistakes while learning. It is part of the process of learning. It is my responsibility to create a classroom environment where everyone feels comfortable to treat learning as a process.

TEACHING PHILOSOPHY

I think it is important to tell you my teaching philosophy, so that you understand why I teach the way that I do. Like Plutarch, I believe that “the correct analogy for the mind is not a vessel that needs filling, but wood that needs igniting.” I generally follow a social constructivist perspective where I try to guide you to help you make meaning of physics for yourself. As such, I will try my best to connect this course to your interests. Please note that I am constantly adjusting my teaching, so that I can do better in trying to help you learn. Please let me know if there is anything I can change to help your learning.

WHY ACADEMIC INTEGRITY MATTERS TO LEARNING

As instructors we want to know if you learned the course material and we give assessments to gauge your level of understanding. If you do anything to misrepresent your understanding, that hurts your learning. I want you to know the material covered in this course, so that it will help you with your future careers. I trust you to participate in this course with the highest academic integrity. Simply put, don't cheat. More officially, do not violate the UT Austin rules on academic dishonesty. Listen to your inner voice that tells you to do the right thing. If you are unsure about something, just ask me. If you violate the UT Austin rules, there are disciplinary penalties, including the possibility of failure in the course and/or dismissal from the University. A violation may include (but is not limited to):

- Providing your UT EID to any other person
- Using unauthorized materials or sources of information on an assessment
- Recording or capturing any course material (assessments, lectures, etc.) in any format
- The public (such that it can be viewed by more than one person) posting of any form of a test bank or group of questions from any assessment
- Failing to properly cite language, ideas, data, or arguments that are not originally yours

If you observe cheating in any manner, you are honor bound to contact the instructor. Students who violate University rules on academic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and/or dismissal from the University. For further information, visit the Student Conduct and Academic Integrity website at <http://deanofstudents.utexas.edu/conduct>.

Course Outline

Week	Date	Day	Lecture	Topics
1	Jun. 2	Th	1	Vectors (Ch. 1.3)
	Jun. 3	F	2	Kinematics (Ch. 1.4) & Frames of reference & relative velocity (Ch. 1.5)
2	Jun. 6	M	3	Newton's Laws of Motion (Ch. 2.3), Weight and normal forces (Ch. 2.5), Tension & compression (Ch. 2.7)
	Jun. 7	Tu	4	Frictional forces between solid surfaces (Ch. 2.8), Newton's Second Law in terms of total momentum (Ch. 2.10), Force from a stream of particles (Ch. 2.11)
	Jun. 8	W	5	Types of energy (Ch. 3.3), Energy transfers (Ch. 3.4), Potential energy & work done by conservative forces (Ch. 3.5), Generalized work-energy theorem (Ch. 3.6)
	Jun. 9	Th	6	Force from potential energy (Ch. 3.7), Potential energy models to predict the force (Ch. 3.8), Bound states & binding energies (Ch. 3.9)
	Jun. 10	F	7	The rules of probability (Ch. 4.3), Discrete & continuous random variables (Ch. 4.4), Discrete probability distributions (Ch. 4.5)
3	Jun. 13	M	--	Midterm Exam 1
	Jun. 14	Tu	8	Mean & variance (Ch. 4.6), Poisson distribution (Ch. 4.7), Binomial distribution (Ch. 4.8)
	Jun. 15	W	9	Sum of independent random variables (Ch. 4.9), Continuous probability distributions (Ch. 4.10), Exponential distributions: fluorescence lifetimes, radioactive decay, and drug elimination from the body (Ch. 4.11)
	Jun. 16	Th	10	Gaussian distribution (Ch. 4.12), The central limit theorem (Ch. 4.13), Parameter estimation, experimental errors, and counting statistics (Ch. 4.14)
	Jun. 17	F	11	Brownian motion (Ch. 5.3), Random walks (Ch. 5.4), The Einstein relation & how we know there are atoms (Ch. 5.5)
4	Jun. 20	M	12	Actin polymerization (Ch. 5.6), Evolutionary "genetic drift" (Ch. 5.7)
	Jun. 21	Tu	13	The diffusion equation (Ch. 6.3), Spherical cows (Ch. 6.4), The rate of actin polymerization (Ch. 6.5)
	Jun. 22	W	14	Rates of change (Ch. 7.3), Administering therapeutics: Continuous infusion with elimination (Ch. 7.4), Administering therapeutics: Oral dosage with elimination (Ch. 7.5)
	Jun. 23	Th	15	Progression of HIV infection in an individual patient (Ch. 7.6), Nuclear chain reactions & atomic bombs (Ch. 7.7)
	Jun. 24	F	16	The Boltzmann factor (Ch. 8.3), DNA unzipping & polymerase chain reaction (Ch. 8.4), Brownian ratchets (Ch. 8.5)
5	Jun. 27	M	--	Midterm Exam 2
	Jun. 28	Tu	17	Binding & reactions (Ch. 8.6), Entropy, temperature & the ideal gas law (Ch. 8.7)
	Jun. 29	W	18	Pressure & hydrostatic pressure (Ch. 9.3), Two types of fluid behavior: laminar fluid flow & turbulent fluid flow (Ch. 9.4), Viscous forces & viscosity (Ch. 9.5)

	Jun. 30	Th	19	Reynolds number (Ch. 9.6), How to describe laminar fluid flow (Ch. 9.7), Laminar fluid flow in a cylindrical tube (Ch. 9.8)
	Jul. 1	F	20	Flow conductance & resistance (Ch. 9.9), Power dissipation in a viscous fluid flow (Ch. 9.10), Murray's law & the "engineering" of the human circulatory system (Ch. 9.11)
	Jul. 4	M	--	4th of July (HOLIDAY)
6	Jul. 5	Tu	21	Simple harmonic motion (Ch. 10.3), Primer on the algebra of complex numbers (Ch. 10.4), Damped simple harmonic motion (Ch. 10.5), Forced damped simple harmonic motion & resonance (Ch. 10.6)
	Jul. 6	W	22	The wave equation & transverse waves on a string (Ch. 11.3), Periodicity in space & time for sinusoidal traveling waves (Ch. 11.4), Sinusoidal traveling waves (Ch. 11.5), Sound waves (Ch. 11.6)
	Jul. 7	Th	23	Longitudinal waves & transverse waves—facts to get straight (Ch. 11.7), Standing waves (Ch. 11.8), Wave reflection & transmission (Ch. 11.9), Clarinets, flutes, and ears: Resonance revisited (Ch. 11.10)
F				Final Exam (Friday, July 8th) [complete between 9 am to 3 pm]

Notice of Research Study

I (Dr. Viranga Perera) am in the process of redesigning the PHY 317 sequence of courses to better align the physics concepts discussed in the courses with the interests and career paths of students in the life sciences. To determine the effectiveness of the redesigned courses, I would like to conduct educational research. As such, I would like to kindly invite you to participate in a research study. There will be an assessment on physics reasoning (30 to 45 minutes to complete) and a survey on attitudes towards physics (8 to 10 minutes to complete) given to all students as part of the usual course assignments both at the beginning of the class and the at the end. All students will be required to complete the pre/post-assessment and survey. However, the research will only use data of those who agree to participate. Your participation is completely voluntary and will have no effect on your course grade. Risks associated with participation in this research study are not expected to be greater than risks associated with everyday life. You will be presented with a form to either agree or decline to participate in this research study. I will not see whether you agreed or declined until after final course grades have been posted. Only data for those who agreed to participate in this study will be used as part of the research. You will receive no direct benefit from participating in this study. The maximum sample size for this research is 250 students.

To agree to participate, you must be 18 years or older. The research data will include your responses and performance on all course assignments and exams, including a survey on attitudes towards physics. While initially these data will include personally identifiable information, at the end of the course, when the research will be conducted, I will anonymize the dataset prior to any research analysis. Similarly, for any presentations or papers that result from this research no participants will be individually identified. Thus, your privacy will be protected. All data will be securely stored and will be securely deleted after 5 years. If you would like to participate, please fill out the Qualtrics form linked in Canvas. As mentioned above, I will not look at this form till after final course grades have been posted. If you agree to participate, but you change your mind during the course you may decline

participation by emailing me. If you drop the course after agreeing to participate, your data will not be used for the study. If you have any questions concerning this study, please contact me (vperera@utexas.edu). If you have any questions about your rights as a participant in this study, or if you feel you have been placed at risk, you can contact the UT Austin Institutional Review Board at <https://research.utexas.edu/ors/human-subjects/> or by calling 512-471-8871.

Course Policies & Disclosures

ABSENCES

If you are going to miss class, please use the UT Austin Student Emergency Services system (<https://deanofstudents.utexas.edu/emergency/>), so that you can get approval for missed work.

RELIGIOUS HOLY DAYS

By [UT Austin policy](#), you must notify me of your pending absence as far in advance as possible of the date of observance of a religious holy day. If you will be missing a class, midterm exam, or assignment to observe a religious holy day, you will be given an opportunity to complete the missed work within a reasonable time after the absence.

NAMES & PRONOUNS

Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences of race, culture, religion, politics, sexual orientation, gender, gender variance, and nationalities. I will gladly honor your request to address you by your chosen name and by gender pronouns you use. Class rosters are provided to me with the student's chosen (not legal) name (if you have provided one). If you wish to provide or update a chosen name, that [can be done easily at this page](#), and you can [add your pronouns to Canvas](#).

TITLE IX DISCLOSURE

Beginning January 1, 2020, Texas Senate Bill 212 requires all employees of Texas universities, including faculty, to report any information to the Title IX Office regarding sexual harassment, sexual assault, dating violence, and stalking that is disclosed to them. Texas law requires that all employees who witness or receive any information of this type (including, but not limited to, writing assignments, class discussions, or one-on-one conversations) must be report it. If you would like to speak with someone who can provide support or remedies without making an official report to the university, please email advocate@austin.utexas.edu. For more information about reporting options and resources, visit <http://www.titleix.utexas.edu/>, contact the Title IX Office via email at titleix@austin.utexas.edu, or call 512-471-0419. Although graduate teaching and research assistants are not subject to Texas Senate Bill 212, they are still mandatory reporters under Federal Title IX laws and are required to report a wide range of behaviors we refer to as sexual misconduct, including the types of sexual misconduct covered under Texas Senate Bill 212. The Title IX office has developed supportive ways to respond to a survivor and compiled campus resources to support survivors. Faculty members and certain staff members are considered "Responsible Employees" or "Mandatory Reporters," which means that they are required to report violations of

Title IX to the Title IX Coordinator. **I am a Responsible Employee and must report any Title IX-related incidents** that are disclosed in writing, discussion, or one-on-one. Before talking with me or with any faculty or staff member about a Title IX-related incident, be sure to ask whether they are a responsible employee. If you want to speak with someone for support or remedies without making an official report to the university, email advocate@austin.utexas.edu. For more information about reporting options and resources, visit the [Title IX Office](#) or email titleix@austin.utexas.edu.

University Resources

Student Emergency Services	If you need to be absent due to a family emergency, medical/mental health concern, or academic difficulty due to crisis or an emergency situation	https://deanofstudents.utexas.edu/emergency/
ITS Service Desk	If you need help with technology for this course	https://its.utexas.edu/contact
Sanger Learning Center	Classes, workshops, private learning specialist appointments, peer academic coaching, and tutoring	https://ugs.utexas.edu/slc/
Services for Students with Disabilities	Students with disabilities, or if you think you may have a disability and need accommodations	http://diversity.utexas.edu/disability/
Counseling & Mental Health Center	If you or anyone you know is experiencing symptoms of stress, anxiety, depression, loneliness, or any other concern	https://cmhc.utexas.edu
University Health Services	General medicine, urgent care, 24/7 nurse line, women's health, sports medicine, physical therapy, lab & radiology services, COVID-19 testing & vaccinations	https://healthyhorns.utexas.edu
Office for Inclusion & Equity	Report any incidents related to equity & inclusion you witness or experience	https://equity.utexas.edu
Behavior Concerns & COVID-19 Advice Line	Concerns about the safety or behavior of fellow students, TAs or professors	https://safety.utexas.edu/behavior-concerns-advice-line
Office of Campus Safety & Security	Sign up for Campus Emergency Text Alerts	https://safety.utexas.edu/

Please keep this syllabus easily accessible, so that you can refer to it throughout the course. I look forward to getting to know you and supporting your learning.