PHY 317L (General Physics II)

57350 Fall 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.

Meeting Times

9 to 9:50 am (Central Time) on Mondays, Wednesdays, and Fridays in PAI 4.42 (Painter Hall)

Instructional Team

INSTRUCTOR

Dr. Viranga Perera (he/him) 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.

DROP-IN HOURS

We will have weekly drop-in hours **TBD**. Please feel free to drop by, ask us questions about the course, or just say hello.

Course Description

In this course we will use calculus to study fundamental principles of electricity, magnetism, optics, and nuclear physics 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.

EXPECTATIONS

As you have enrolled in this course, you have taken on the responsibility of keeping up with the coursework and to communicate with the instructional team if you run into any difficulties with the course. I expect you to attend each class. I understand that there may be circumstances when you will not be able to attend. That is alright, but please let me know over email if you will need to miss a class. By coming to class, I expect you to come on time and prepared (e.g., reading the assigned textbook sections). Please be respectful towards everyone in the class. Feel free to ask me questions if you do not understand something by raising your hand. Kindly refrain from any activities that are not directly related to the class (e.g., using your cell phone, being on social media websites, etc.).

PRE-REQUISITES

Physics 317K and 117M with a grade of at least C- and credit with a grade of at least C- or registration in Physics 117N.

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 to find a desired parameter
- 5. Translate a new problem/situation in nature into a physics problem
- 6. Work with different people 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 send out periodic course announcements via Canvas. It is your responsibility to ensure that you receive those 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. Given that this is a large class, 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 at the email addressed listed above.

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 addresses for the instructional team.

Course Material

TEXTBOOK

We will be using *University Physics for the Life Sciences* by Knight et al. (first edition). I want to be mindful of the high cost of textbooks. As such, this textbook will be offered electronically through the Longhorn Textbook Access (LTA) program

(https://provost.utexas.edu/initiatives/longhorn-textbook-access/) for \$35.37. Once you purchase the textbook, it will not expire and you will have access to it even after the class. If you are planning on taking the MCAT, see Appendix C of the textbook. There are many textbooks that cover the course topics and each present the material in slightly different ways. It may help you to look at the same material presented in a different textbook (e.g., the free OpenStax university physics textbook [Volume 2 & Volume 3]).

QUEST

You will do your homework assignments 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 <u>https://quest.cns.utexas.edu</u> 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.

All students will be automatically enrolled an optional math review course on Quest. During this class if you come across specific math concepts that you would like to review, you can do practice problems on the math review course.

Course Structure & Grading

READINGS (15%)

You are expected to read specific sections of the textbook prior to each lecture. If you purchased the textbook through the LTA program, you can access it by clicking on the My Textbooks tab on the left. For each reading assignment, **you are expected to make** at least **one meaningful comment** (e.g., connect the reading to a previous class), **pose a question** (e.g., asking how the textbook derived an equation), or **answer someone else's question** on Ed Discussion to get full credit for each reading assignment. **Readings are due at 7 am before each lecture** (there will be a Canvas assignment for each reading to upload a screenshot of your comment/question). You will have three reading assignments per week. **I will automatically drop your three lowest**

<u>reading assignments.</u> It is best that you try to do all reading assignments as <u>this drop policy is</u> <u>meant for contingencies</u>.

LECTURES (15%)

I will give active lectures in that they will be divided into short sections and include short quizzes (i.e., formative assessments). Those quizzes will be given through Instapoll and questions will be multiple choice. Quizzes will only be graded for participation and they will be used to assess your understanding. <u>I will automatically drop your three lowest quiz days</u>. It is best that you try to attend all lectures as <u>this drop policy is meant for contingencies</u>. During lectures, there will be opportunities for you to ask me questions. I am here to help you learn, so it is completely alright to tell me if you do not understand something. I will post all lecture materials (e.g., PowerPoint slides and notes) on Canvas after each class period. Lecture recordings will also be available for review after class through Lectures Online.

HOMEWORK (25%)

You will complete two homework assignments each week (due at 11 pm [CDT] on Mondays and Thursdays), which you will 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. <u>I will automatically drop your three lowest homework grades</u>. It is best that you try to do well on all homework assignments as <u>this drop policy is meant for contingencies</u>.

MIDTERM EXAMS (25%)

Midterm exams are opportunities for you to demonstrate your understanding of the course material. **You will have three midterm exams covering material just prior to that particular midterm** (i.e., midterms are not comprehensive). Each midterm will take place in class and you will have 50 minutes to complete the exam. You are of course required to take midterm exams individually. When taking the exams, you may have one (front and back) handwritten notes sheet on letter paper (you should only have equations and helpful notes to yourself, not complete solutions to homework problems), a programmable calculator (generally any calculator is fine, so long as it cannot connect to the internet), and scratch paper. No books or any online resources are allowed. I will provide more specific details via a Canvas announcement prior to each exam. **I** will automatically drop your lowest midterm score. After dropping your lowest midterm, if your final exam score exceeds the lowest remaining midterm 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.

FINAL EXAM (20%)

The final exam is an opportunity for you to demonstrate your comprehensive understanding of the course material. Your final exam will take place on **Saturday, December 10th, from 8 to 10 am**. The final exam will be approximately 1.5-hours long. The final exam has the same policies as midterm exams. The only difference is that you may have two (front and back) handwritten notes sheets on letter paper for the final exam. <u>The final exam is required and must be taken at the time designated by the university</u>.

GRADE BREAKS

Grade	Cutoff
А	94%
A-	90%
B+	87%
В	84%
B-	80%
C+	77%
С	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):

- Taking Instapoll quizzes when not attending class
- 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	Class	Topics
	1	Aug. 22	М	1	Course Introduction, Models of Light (Ch. 18.1)

				Thin-Film Interference (Ch. 18.2), Double-Slit Interference (Ch.
	Aug. 24	W	2	18.3), The Diffraction Grating (Ch. 18.4)
	Aug. 26	F	3	Single-Slit Diffraction (Ch. 18.5), Circular-Aperture Diffraction
	Aug. 20	1	5	(Ch. 18.6), X Rays & X-Ray Diffraction (Ch. 18.7)
	Aug. 29	М	4	The Ray Model of Light (Ch. 19.1), Reflection (Ch. 19.2), Refraction (Ch. 19.3)
2	Aug. 31	W	5	Image Formation by Refraction (Ch. 19.4), Thin Lenses: Ray Tracing (Ch. 19.5), The Thin-Lens Equation (Ch. 19.6)
	Sep. 2	F	6	Image Formation with Spherical Mirrors (Ch. 19.7), Color & Dispersion (Ch. 19.8)
	Sep. 5	М		Labor Day (HOLIDAY)
3	Sep. 7	W	7	Lenses in Combination (Ch. 20.1), The Camera (Ch. 20.2), The Human Eye (Ch. 20.3)
	Sep. 9	F	8	Magnifiers & Microscopes (Ch. 20.4), The Resolution of Optical Instruments (Ch. 20.5), Microscopy (Ch. 20.6)
	Sep. 12	М		Midterm Exam 1
4	Sep. 14	W	9	The Charge Model (Ch. 21.1), A Microscopic Model of Charge (Ch. 21.2), Coulomb's Law (Ch. 21.3)
	Sep. 16	F	10	The Electric Field (Ch. 21.4), The Electric Field of Multiple Charges (Ch. 21.5)
	Sep. 19	М	11	The Motion of a Charged Particle in an Electric Field (Ch. 21.6), The Torque on a Dipole in an Electric Field (Ch. 21.7)
5	Sep. 21	W	12	Electric Potential Energy (Ch. 22.1), The Electric Potential (Ch. 22.2), Calculating the Electric Potential (Ch. 22.3)
	Sep. 23	F	13	The Potential of a Continuous Distribution of Charge (Ch. 22.4), Sources of Electric Potential (Ch. 22.5)
	Sep. 26	М	14	Connecting Potential & Field (Ch. 22.6), The Electrocardiogram (Ch. 22.7)
6	Sep. 28	W	15	Capacitance & Capacitors (Ch. 23.1), Combinations of Capacitors (Ch. 23.2)
	Sep. 30	F	16	Dielectrics (Ch. 23.3), Electrostatics in Salt Water (Ch. 23.4)
	Oct. 3	М	17	The Membrane Potential of a Cell (Ch. 23.5)
7	Oct. 5	W		Midterm Exam 2
	Oct. 7	F	18	A Model of Current (Ch. 24.1), Defining Current (Ch. 24.2), Batteries & emf (Ch. 24.3)
8	Oct. 10	М	19	Resistance & Conductance (Ch. 24.4), Ohm's Law & Resistor Circuits (Ch. 24.5)
	Oct. 12	W	20	Energy & Power (Ch. 24.6), Alternating Current (Ch. 24.7)

	Oct 14		-01	Circuit Elements & Diagrams (Ch. 25.1), Using Kirchhoff's Laws
	Oct. 14	F	21	(Ch. 25.2), Series & Parallel Circuits (Ch. 25.3)
9	Oct. 17	М	22	Measuring Voltage & Current (Ch. 25.4), More Complex Circuits (Ch. 25.5), Electric Safety (Ch. 25.6)
	Oct. 19	W	23	RC Circuits (Ch. 25.7), Electricity in the Nervous System (Ch. 25.8)
	Oct. 21	F	24	Magnetism (Ch. 26.1), The Magnetic Field of a Current (Ch. 26.2), Magnetic Dipoles (Ch. 26.3)
	Oct. 24	М	25	The Magnetic Force on a Moving Charge (Ch. 26.4), Magnetic Forces on Current-Carrying Wires (Ch. 26.5)
10	Oct. 26	W	26	Forces & Torques on Magnetic Dipoles (Ch. 26.6), Magnetic Resonance Imaging (Ch. 26.7)
	Oct. 28	F	27	Induced Currents (Ch. 27.1), Motional emf (Ch. 27.2), Magnetic Flux & Lenz's Law (Ch. 27.3)
	Oct. 31	М	28	Faraday's Law (Ch. 27.4), Induced Fields (Ch. 27.5), Electromagnetic Waves (Ch. 27.6)
11	Nov. 2	W	29	Polarization (Ch. 27.7), The Interaction of Electromagnetic Waves with Matter (Ch. 27.8)
	Nov. 4	F		Midterm Exam 3
	Nov. 7	М	30	Physics at the Atomic Level (Ch. 28.1), The Photoelectric Effect (Ch. 28.2), Photons (Ch. 28.3)
12	Nov. 9	W	31	Matter Waves (Ch. 28.4), Energy is Quantized (Ch. 28.5), Energy Levels & Quantum Jumps (Ch. 28.6)
	Nov. 11	F	32	The Uncertainty Principle (Ch. 28.7), Applications of Quantum Physics (Ch. 28.8)
	Nov. 14	М	33	Spectroscopy (Ch. 29.1), Atoms (Ch. 29.2), The Hydrogen Atom (Ch. 29.3)
13	Nov. 16	W	34	Multi-electron Atoms (Ch. 29.4), Excited States & Spectra (Ch. 29.5), Molecules (Ch. 29.6)
	Nov. 18	F	35	Fluorescence & Bioluminescence (Ch. 29.7), Stimulated Emission & Lasers (Ch. 29.8)
				Fall Break/Thanksgiving
	Nov. 28	М	36	Nuclear Structure (Ch. 30.1), Nuclear Stability (Ch. 30.2), The Strong Force (Ch. 30.3)
14	Nov. 30	W	37	Radiation & Radioactivity (Ch. 30.4), Types of Nuclear Decay (Ch. 30.5), The Interaction of Ionizing Radiation with Matter (Ch. 30.6)
				Nuclear Medicine (Ch. 30.7), The Ultimate Building Blocks of
	Dec. 2	F	38	Matter (Ch. 30.8)
15	Dec. 2 Dec. 5	F M	38 39	

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 a survey on attitudes towards physics (8 to 10 minutes to complete) both at the beginning of the class and the at the end. 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 of 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 only look at the survey data 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. 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

I completely understand that you may miss class due to contingencies. In those cases, kindly use the drop policies mentioned above as they are available to all students for any reason. Thus, your missed assessments will not affect your final course grade. **If you miss assessments beyond the allocated drops, you will need to have a note from the Student Emergency Services** (https://deanofstudents.utexas.edu/emergency/), so that you can get approval for missed work.

RELIGIOUS HOLY DAYS

By <u>UT Austin policy</u>, 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 if it is beyond the contingency policies already outlined above.

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 <u>can be done easily at this page</u>, and you can <u>add your pronouns to Canvas</u>.

LECTURES ONLINE

We will be using the Lectures Online recording system. This system records the audio and video material presented in class for you to review after class. Links to the recordings will appear in the "Lectures Online" tab on Canvas. You can learn more about how to use Lectures Online at <u>http://sites.la.utexas.edu/lecturesonline/students/how-to-access-recordings/</u>. You can find additional information at: <u>https://sites.la.utexas.edu/lecturesonline/</u>.

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 <u>advocate@austin.utexas.edu</u>. For more information about reporting options and resources, visit the <u>Title IX Office</u> or email <u>titleix@austin.utexas.edu</u>.

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/
Disability & Access	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.