

PHYS 122 H: Introductory Physics II | Spring 2020

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Class Times: M/W/F 9-9:50 AM Interdisciplinary Life Sciences (ILS) 401
Discussion: Tuesdays 2:30 – 4:20 ILSB 230 (TA: Rachel Gelfand)

Welcome to PHYS 122H! In this course we will take on two of the pillars of classical physics: thermodynamics and electromagnetism. The former involves heat, temperature, entropy and explains things as every day as engines and refrigerators and as difficult to grasp as the expansion of the Universe and eruptions from black holes. The latter (electricity and magnetism) covers charges, currents, and electric and magnetic fields under static and time-variable conditions. With it we can grasp a great deal of phenomena, from the inner workings of electronics to lightning.

As was the case in PHYS 121H, the goal of this course is not only to teach you the basics of these branches of classical physics, but also to **think like a physicist**. Many of you will find this challenging at first, especially if you have been taught in an environment with a lot of testing which tends to emphasize memorization and learning ‘by rote’ rather than true understanding and physical insight. Be not afraid – we will help you to learn these other skills as well. Because our goal is to teach you to think like a physicist, this is largely an active learning course. **This means that you will be responsible for your first exposure to the material, through both reading and pre-lecture videos.** The in-class time will be spent challenging you and asking questions to cement your understanding of the concepts. There will be many opportunities in class, during the discussion session, during office hours, and online to ask questions and improve your understanding. If you have not experienced ‘active learning’ before, you might be worried, but don’t be. We’ve worked hard to make sure that the expectations for the course are as clear as possible so as long as you follow directions outlined in this syllabus and show up to class with a spirit of curiosity and openness to learning, you will do great.

Elements of this Course:

Reading Before Lecture.

Below you will find a course schedule which lists the topic of each lecture, as well as the dates of quizzes, and when pre-lectures (described below) and homework is due. For each lecture, to the right you will find a corresponding reading assignment. One of the major transitions you will make in college is towards a much higher reliance on reading and self-teaching from reading. Why is this important? As you get to higher and higher levels in your chosen field (whether physics or something else), you will inevitably get to the point where *there is no class for what you want to learn*. There are only books and published papers. At this point, your years of training yourself to read and understand concepts from a textbook or similar source will really be important. The Course Materials Initiative (CMI) which is offered for this course, provides you with electronic access to the textbook we use (see below). However, if you prefer to read a paper copy, you are by all means encouraged to obtain one (be sure to get the right edition (6th), but used is fine and usually much cheaper).

Pre-Lecture.

Each week, there will be one or two “pre-lecture” videos provided under the FlipItPhysics program (see “Accessing Course Materials” below or on the Blackboard site). These videos are required watching &

will provide an introduction to the material that will be covered that day. *I highly recommend that you first read the associated material in the textbook* (which will necessarily be more comprehensive & informative than a video), and *then* watch the pre-lecture as a kind of “summing it all up” experience, though you are encouraged to do what works for you. Further below in this syllabus you will find a detailed schedule for the semester that lists both the reading sections for each lecture and the dates that pre-lectures are due.

During the pre-lecture, there are “checkpoint” questions that will check your understanding of the material at a basic level (this is also why it is best that you read first, watch video second). In the FlipItPhysics system, you will login to watch the video and complete the checkpoint. Both must be completed by 8 AM on the day assigned in order to get credit (note: for obvious reasons, it is generally preferable to do these the day before or earlier unless you enjoy getting up very very early).

The combined pre-lecture and checkpoints are worth 5% of your final grade.

Quizzes.

Each week that there is not a midterm, there is a quiz on Friday. These will be at the beginning of class on the dates listed in the schedule, and will generally cover material since the last quiz, though anything covered so far in the course is fair game. *The quiz questions for each upcoming quiz will be posted on blackboard each week after the discussion class (Tuesday evening). You read this correctly: the questions (usually about 3) for the quiz will be given to you in advance.* The goal of the weekly quiz is to give you the opportunity to work on test-like problems that really allow you to demonstrate your understanding of the material and your ability to clearly solve problems and formulate a comprehensive solution. In my opinion, the only way to give you the time to understand and formulate more advanced questions is to have access to them in advance. You are to work on these problems largely alone, although it is permissible to check with other students after you have attempted your own solution. This is entirely on your honor, but I do not want large study groups to get together to solve the problems en masse, which often devolves into one “smart” student telling everyone else how to do the problem. This, for obvious reasons, is bad for your education in physics. Conferring with others in a more general way is not banned, however.

On the actual day, the quiz is closed-book and closed notes and will last 15-ish minutes. You will be given one of the problems in the packet to solve (you will not know which one, so it is necessary to solve them all in advance). You may use a calculator but cell phone use is banned.

The quizzes are worth 7.5% of your final grade.

Lecture.

Clickers will be used to track attendance and promote active learning by providing instant feedback for both myself and for you. It is your responsibility to both bring your clicker to every class and to make sure it is working properly. If your clicker does not work or if you forget your clicker, you will not receive attendance credit for that day. Be sure to have extra batteries for it as well. The lecture slides will usually be posted on Blackboard before every lecture. These will provide you with the structure of every lecture and help to facilitate the note-taking process. It is important to remember that these slides are not the complete content of the class but only an outline and so studying them only is not a substitute for attending lectures. If you miss any lectures, you are still responsible for the material covered.

Participation credit for lecture (through clicker responses) is worth 5% of your final grade.

Discussion.

Discussions are weekly meetings where you work on a packet of problems in small groups and under the observation of the discussion instructor. For this course, discussion will be held on Tuesdays from 2:30--4:20 PM in the new Interdisciplinary Life Sciences Building, Room 230. Discussion is designed to provide you with a collaborative learning environment so you can help and learn from each other. Some of the assigned problems will be quite challenging. We find that this is the best environment to tackle these problems, which can have solutions which are at first counter-intuitive, because of the group environment. However, each student is ultimately responsible for writing out and fully understanding the solution to all problems in the packet. "Direct copying", besides sabotaging your learning, will also be penalized if observed by the instructor.

The discussion grade is a "completion" grade – before you can leave the discussion, the TA will check your answers and be sure that you understand all the solutions with a few pointed questions. If any answers are incorrect, you will be sent back to figure it out (perhaps with a hint). In the rare case where, despite working diligently through the entire discussion, a student is unable to finish all the problems, it will still be possible to get a full completion grade at the discretion of the TA.

Attendance at discussion is mandatory and full attendance is required. A penalty of 50% of the grade will be imposed if you arrive more than 10 minutes late. You are allowed to bring your calculator and any notes you have taken from lecture, the textbook, or FlipItPhysics, but you are not allowed to use any other electronics such as laptops or cellphones. You are certainly encouraged to request hints from the TA or your classmates when stuck on a problem!

The discussion grade is 10% of your total final grade.

Homework.

A major part of the learning process and your success will come about as a result of doing homework. If you do not put forth a serious effort into your homework (and the quiz problems), you will likely NOT do well in this class. Individual homework will be submitted via the FlipItPhysics online system. For each pre-lecture unit, there is one associated homework unit. As a general rule, assignments will be due about 4 days after the pre-lecture at 11:59 PM (*i.e., midnight*). *Please print out the course schedule and keep track of the homework deadlines!*

You are normally allowed six submissions per question. Homework questions can in general be difficult and you will probably find that you will spend a significant amount of time on them. Don't put off assignments until the night before they are due. Instead, start your homework early so you have the time to properly digest the concepts and get assistance from the TA hours or office hours, or other students. Sometimes you will need to "sit" on a question you at first fail to answer and return to it after thinking about it for a while. Like in the discussion, you are encouraged to work together, however, it is your responsible to fully understand the material.

Homework is worth 7.5% of your final grade, however you should **not** make the mistake of thinking it is not very important. It is the primary way that you will prove your mastery of the concepts to yourself and prepare for exams (which are 65% of your final grade). Take homework seriously.

A note on time spent on this course: new students may not be aware of the “3x” rule for estimating how much time a college course will require outside of lecture (and discussion). In general, the number of hours is at least 3 times the credit hours. That means that you should be spending about 9 hours per week reading and studying outside the classroom. Exceeding this number slightly is normal and often typical for physics courses. In my experience, students need to spend about 10-15 hours per week on the course to do well, and this includes significant time reviewing/solidifying material for midterms well in advance. Please spend some time planning where in the week you will put the time for this course. If you need help sticking to a plan, consider getting a “reading buddy” to read the text or watch pre-lecture at the same time as you (similar to how “workout buddies” can greatly improve your attendance at the gym!). If you feel that you are struggling with the load in this course, please feel free to come speak to me about it office hours. It’s important that problems are addressed early and feedback is always welcome.

[Accessing Course Materials & Resources](#)

Blackboard.

This course will use a custom site at blackboard.umbc.edu to transmit course materials (such as lecture slides, solutions, etc) and organize announcements (which will also arrive in your inbox). It is the main site for all course information. Your grade will also be visible and updated regularly here. The Blackboard site will include a discussion board where you can post questions – please use it!

Textbook.

This course is participating in the “Course Materials Initiative” (CMI). Through this program, all students receive immediate access to an electronic version of the required textbook (e-textbook), **Physics for Scientists and Engineers 6th edition by Tipler**, via the *VitalSource Bookshelf* link in *Blackboard*. The charge for electronic access to the book is billed through your tuition and fees statement at UMBC. **A code will be emailed to you before the semester starts.** Please contact the bookstore if you do not have access to the book at least a week before classes begin! You will have access to the e-book for three full years (from the beginning of the semester). Make sure to download the VitalSource App for offline use.

Opting Out of CMI - Your participation in the CMI is completely optional. You may opt out of the program and receive a full refund by completing the [CMI Consent for Removal Form](#) (search on my.umbc.edu) and submitting it in person to the Bookstore Textbook Managers desk by September 11th.

Please visit the CMI webpage, bookstore.umbc.edu/cmi, for more information!

FlipItPhysics.

As well as having automatic access to an electronic version of the required textbook, CMI also gives you access to the FlipIt Physics website (www.flipitphysics.com) using your individual code which is emailed to you. **Please make sure to access this prior to the add/drop date September 11th (you will need to, in any case, for the first pre-lecture due on August 28th).** If you have opted out of CMI, you can still

join the course under a temporary account (in case you drop the course), and you will have several weeks to purchase access through the site itself.

The code to join this course (PHYS 122H Spring 2020) is: 41d966ab

Your Grade:

Pre-lecture and checkpoint on FlipItPhysics: 5%

Quizzes: 7.5%

Lecture Participation (clicker): 5%

Homework: 7.5%

Discussion: 10%

Exams (each, there are 3): 15%

Final Exam: 20%

You can find your current grade on the course Blackboard site. It will generally be up-to-date to within the last week.

Make-up and Late Policies:

Lecture: You will be given two “free” days for not clicking in lecture. These count towards ALL absences and clicker malfunctions.

Online FlipIt Physics pre-lecture, checkpoints and homework: A one-time extension of one week is available once per semester (for a single assignment) to all students. Otherwise make-up work is generally not allowed except in extreme circumstances*.

Discussion: There is no make-up discussion. If you must miss a discussion for legitimate reasons*, contact Dr. Worchesky as soon as possible to make an alternative arrangement.

Quizzes: There are no make-up quizzes, however if you miss a quiz for legitimate reasons*, you must contact me as soon as possible.

Mid-term exams: Make-ups will only be allowed for legitimate reasons*, and it is your responsibility to contact me regarding arrangements for a possible make-up.

Final exam: There is NO make up for the final exam. An alternate time for the final exam will be allowed in cases where the final exam of another class conflicts with our final exam (you will be required to provide documentation showing this). It is your responsibility to find out when your final exams will occur and e-mail me well in advance of the week of finals if you discover a conflict with another class.

**Legitimate reasons are defined as officially-sanctioned UMBC activities, illness, family emergency, detention by authorities, or another insurmountable difficulty. I'll request written verification for the cause of your absence.*

Course Resources and Additional Help:

*Instructor Office Hours**: Mondays/Fridays 10-11:15 AM

Physics Tutorial Center (Physics 226A): TAs offer walk-in assistance Monday through Thursday 12-5 PM.

SI/PASS Sessions: The Learning Resource Center (located in Sherman Hall Room 345; <http://www.umbc.edu/lrc/>) holds SI (supplemental instruction) through PASS (peer assisted study sessions) for this and many other 100- and 200-level courses. The times and locations for these sessions will be posted on our Blackboard site.

Physics Tutors: The LRC also has physics tutors with walk-in hours as well as more in-depth small group sessions. The times and locations will be posted on Blackboard.

Discussion Board: A discussion board is available on Blackboard for both general questions about the course (such as questions regarding course policies) as well as physics related questions.

If necessary, you may make appointments by email to meet with me outside of these times, but please do so **only if you have a conflict with existing office hours. Be advised that because of my research, I am generally off-campus on Tuesdays and Thursdays – plan accordingly! Sometimes the best time to get a question answered is before class. Homework will generally be due on Sundays at midnight, so be sure to start early enough to use the office hours and TA hours during the week, if needed. You may also use the discussion board on blackboard to post questions about homework. This is actually preferable to email as we will want to ‘learn together’ as a group – if you have a question, it is very likely someone else does too, so help them out and post it on blackboard rather than sending an email.*

Academic Integrity

All instances of academic misconduct will be addressed according to the UMBC Policy on Academic Integrity. Examples include attempting to make use of disallowed materials on quizzes and exams, attempting to communicate with anyone other than the instructor or TA during an exam, altering graded work and submitting it for regrading, asking someone else to take an exam in your place, copying another’s work on homework, asking someone else to do homework and representing it as your own, and permitting or assisting another student to carry out any of the above. Penalties range from a grade of 0 on a homework or exam to an F in the course (at my discretion), and from denotation of academic misconduct on the transcript to expulsion (as determined by official hearing of the Academic Conduct Committee.

Student Disability Services

If you have any condition such as a physical learning disability, which will make it difficult for you to carry out the work as I have outlined it or which will require academic accommodations, please notify me in the first two weeks of the course. For those students that are allowed extra time on exams based on their accommodations, it is your responsibility to arrange to take exams with SDS and you must contact SDS at least 48 hours before every exam to make appropriate arrangements.

Course Schedule

Week	Date	Pre-Lecture <i>Due 8:00 AM</i>	Quiz <i>9 AM</i>	HW <i>12 AM*</i>	Lecture Topic	Textbook	Discussion
							<i>Tuesdays</i>
1	Jan 27 (M)	1			Intro to Thermodynamics, Ideal Gas Law	17: 1-3	(1) Introduction, Ideal Gas Law
	Jan 29 (W)	2			Heat, Calorimetry	18: 1-3	
	Jan 31 (F)		1	1	Kinetic Theory of Gases	17: 4	
2	Feb 3 (M)	3		2	Molar Heat Capacity, PV diagrams	18: 4-8	(2) Ideal Gases and Heat Capacity
	Feb 5 (W)	4			Ideal Solids, Thermal Expansion	20: 1-4	
	Feb 7 (F)		2	3	Equipartition and Adiabatic Compression	18: 8-9	
3	Feb 10 (M)	5		4	Heat Engines	19: 1-3	(3) Work, Heat Engines
	Feb 12 (W)	6			Irreversibility, Entropy	19: 5	
	Feb 14 (F)		3	5	Thermo Review		
4	Feb 17 (M)			6	Thermo Review		(4) Thermo Review
	Feb 19 (W)				Midterm 1 (Units 1-6, Ch 17, 18, 19, 20)		
	Feb 21 (F)	7			Electric Charge, Coulomb's Law	Ch 21: 1-3	
5	Feb 24 (M)	8			Electric Field	Ch 21: 4-6	(5) Coulomb's Law, Electric Flux & Fields
	Feb 26 (W)	9		7	Electric Field – Applications	Ch 22: 1-2	
	Feb 28 (F)		4	8	Electric Flux and Field Lines	Ch 22: 1-2	
6	Mar 2 (M)	10		9	Gauss' Law	Ch 22: 3	(6) Gauss' Law
	Mar 4 (W)	11			Applications of Gauss' Law	Ch 22: 4-6	
	Mar 6 (F)		5	10	Electric Potential	Ch 23: 1-3	
7	Mar 9 (M)	12		11	The Field from Electric Potential	Ch 23: 4-6	(7) Electric Potential
	Mar 11 (W)	13			Conductors and Capacitance	Ch 24: 1	
	Mar 13 (F)		6		Electricity Review		
	Mar 16 (M)						
	Mar 18 (W)						
	Mar 20 (F)						
8	Mar 23 (M)	14		13	Capacitors (guest lecture by Agniva R.)	Ch 24: 1-3	(8) Electricity Review
	Mar 25 (W)				Midterm 2 (Units 7-13, Ch 21, 22, 23, 24.1)		
	Mar 27 (F)	15			Electric Current, Dielectrics	Ch 24: 3-5	
9	Mar 30 (M)	16		14	Circuits	Ch 25: 1-4	(9) Capacitors & Circuits
	Apr 1 (W)	17		15	Kirchoff's Rules	Ch 25: 5	
	Apr 3 (F)		7	16	RC Circuits	Ch 25: 6	
10	Apr 6 (M)	18		17	More Circuits	Ch 25	(10) RC Circuits, Magnetic Force
	Apr 8 (W)	19			Magnetic Force	Ch 26: 1	
	Apr 10 (F)		8	18	Forces and Torques on Currents	Ch 26: 2	
11	Apr 13 (M)			19	Circuits, Intro Magnetism Review	Ch 26: 3-4	(11) Unit 3 Review
	Apr 15 (W)				Midterm 3 (Units 14-19, Ch 24, 25, 26.1, 26.2)		
	Apr 17 (F)	20			Biot-Savart Law	27: 1-3	
12	Apr 20 (M)	21			Gauss' Law for Magnetism	27: 1-3	(12) Magnetostatics
	Apr 22 (W)	22		20	Ampere's Law	27: 4	
	Apr 24 (F)		9	21	Magnetic Flux	28: 1	
13	Apr 27 (M)	23		22	Faraday's Law	28: 1-3	(13) Magnetic Fields
	Apr 29 (W)	24			Motional EMF	28 3-4	
	May 1 (F)		10	23	Inductance	28: 5-6	
14	May 4 (M)	25		24	AC Circuits	29: 1-2	(14) Capstone Discussion
	May 6 (W)				E&M Review		
	May 8 (F)		11**	25	E&M Review		
15	May 11 (M)				E&M Review		
	May 15 (F)				Likely Final Exam Based on Prior Year Schedule (8 AM – 10 AM)		

*Homework is generally due at 11:59 the day before noted. Other "due times" listed here are for the day of the note.

** extra credit "review quiz"