Physics 260, University Physics II

Dr. Jessica Rosenberg
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Logistics:

Time: MW 1:30 – 3:20
Office hours: Planetary Hall 219, W 3:30-4:30 or by appointment
Textbook: University Physics volume 2 (Young and Freedman) + **Modified** Mastering Physics

Learning assistants:

Fernando Rodriguez (frodri@gmu.edu)
Avin Seneviratne (asenevi@gmu.edu)

Review sessions weekly in EXPL L506:
Email a picture of a pretzel to jrosenb4@gmu.edu
Monday: 3:30 – 4:30 (i.e., after class)
Thursday: 11:00 – 12:00
Friday: 11:30 – 12:30

Free Physics tutoring:

Free physics tutoring is available Mondays, Wednesdays and Thursdays from 10:30 AM to 3:30 PM via zoom link. To access tutoring email Shalom Fisher (sfisher2@gmu.edu) to let him know when you would like to attend.

Welcome to the second semester of introductory physics! We are looking forward to working with you and to introducing you to this fundamental area of physics.

Course overview - Why Is Understanding Electricity & Magnetism Important

Physics 260: University Physics II is an introduction to electromagnetic fields and forces. Electromagnetic forces quite literally dominate our everyday experience. Because of the strength of electromagnetic forces, any small imbalance in net electric charge gives rise to enormous forces that act to try to erase that imbalance. Thus, in our everyday experience, matter is by and large electrically neutral, and our direct experience with electromagnetic phenomena is disguised by many subtleties associated with that neutrality. This is very unlike our direct experience with gravitational forces, which is straightforward and unambiguous.

Understanding electromagnetic fields is essential to our understanding the world around us. The most fundamental processes in nature, from the forces that determine the structure of atoms and molecules to the phenomena of light to nerve impulses in living systems, depend on electric and magnetic fields.

It is fundamental to current and future technologies. Motors, power generation and transmission, electronics, sensors, and communication – both wired and wireless – involve the manipulation of electric or magnetic fields. There are few advances in technology that can be made without the use of electronic circuits or electric and magnetic fields.

It is the simplest example of unification in science. A large and diverse body of observational facts can be explained in terms of a few simple concepts. The phenomena of electricity and magnetism, which appear to be completely different, are shown to be two manifestations of the same physics. The theory requires few if any approximations. Results can be predicted with great accuracy. In general, and E&M in particular, starts with the smallest set of fundamental assumptions to understand a wide range of physical phenomena.

<u>Connections to other disciplines:</u>

Electricity and magnetism are at the heart of many of the scientific disciplines. In biology, living organisms rely on it for everything from the collection of pollen by bees to the functioning of neural systems to the sensing prey. The behavior of atoms and molecules is driven almost entirely by their electromagnetic properties. Many of the engineering disciplines rely on the understanding of transformers, circuits, and other devices built on the principles of electricity and magnetism.

Many students who are not in the sciences or in electrical engineering ask why they have to take physics II as the connections to their disciplines (most often other engineering disciplines) are not clear. While you might not build circuits or solve vector field equations, you will develop your ability to solve a complex mathematical problem which is a tool that is useful in many disciplines. I hope you will also gain an appreciation of this subject which is so fundamental to our existence in the world.

Course Goals:

- Understand how electricity and magnetism is relevant to your life and/or your course of study.
- Understand basic concepts of electricity and magnetism.
- Learn the equations for, and solve problems using Coulomb's Law, Gauss's Law, and Ampere's Law.
- Solve simple circuits involving resistors, capacitors, inductors, batteries, and AC voltage sources.

Mason Core Learning Outcomes

- Understand how scientific inquiry is based on investigation of evidence from the natural world, and that scientific knowledge and understanding: a) evolves based on new evidence, and b) differs from personal and cultural beliefs.
- Recognize the scope and limits of science.
- Recognize and articulate the relationship between the natural sciences and society and the application of science to societal challenges (e.g., health, conservation, sustainability, energy, natural disasters, etc.).
- Evaluate scientific information (e.g., distinguish primary and secondary sources, assess credibility and validity of information).
- Participate in scientific inquiry and communicate the elements of the process, including: a) making careful and systematic observations, b) developing and testing a hypothesis, c) analyzing evidence, and d) Interpreting results.

Course Structure and Rules:

You are expected to attend every class, arrive on time, remain the entire period, come prepared, and be constructively and respectfully engaged. It will be quite difficult to earn full participation credit if you haven't done the reading and are unable or unwilling to commit to the day's activities.

When you arrive in class you may be asked to write a solution from the previous class, tutorial, or a homework solution on the board. Come prepared.

White board rules:

- Write the names of the people in the group with a star next to the person writing next to your problem
- Each problem has to be written by different member of the team
- Remember to bring your pens and eraser to every class

This course requires effort outside of class time: It is expected that you will spend 7-9 hours/week outside of class working on the material. If you spend less, do not be surprised that you are not doing well. If you spend more talk to me to discuss how to work more efficiently.

Blackboard contains week-by-week modules: The schedule at the bottom of this document gives a rough outline of the course structure and deadline, but see Blackboard for the most up-to-date schedule and details.

Learning assistants: Learning assistants are undergraduates (i.e., your peers) who provide support for your learning. *Seek their help*. Talk with them about what you do and do not understand. Explain to them your reasoning and it will help you be successful in this course. The LAs have taken this course and been selected both for their understanding of the material and their ability to interact with their peers. *You are expected to treat your LAs with respect.* They have a lot of knowledge to share with you, but they are also your peers and will make mistakes as they are learning as part of this process as well.

Reading: *Do the reading prior to the start of each class session.* Email a silly animal picture to jrosenb4@gmu.edu. The reading is designed to give you a background understanding of the topic before you come to class. How you read is important. You do not read a textbook like a novel it is a process of reading, solving problems, going back to check for understanding, and then moving forward. The book provides excellent advice on studying for science classes including reading the textbook. I highly recommend it. Here are some suggestions:

- Read checking for understanding by asking yourself questions about each paragraph
- Stop and solve all example problems without looking at the solutions
- If you get stuck on a sample problem don't look at the answer, go back and read the text for understanding

Tutorials: Tutorials are guided exercises to help you understand key parts of the course material. You will work on these during the class period but will need to finish them on your own if we run out of time during the class time. You may (and should) discuss your work on these with others in the class but you need to turn in your own versions of the answers. You will have to know how to solve these problems so make sure you can solve them. These will be graded on effort.

Homework: Homework is very important for learning physics. It is on the homework that you get to practice the skills that we are working on. Homework assignments may be accessed through the Mastering Physics. To register, you will need an access code, purchased with your textbook. If you already have the book, the individual access code may be purchased separately from the bookstore. If you have purchased Modified Mastering Physics in the past two years you don't need to buy a new code. Note that you need to purchase **Modified** Mastering Physics.

While Mastering Physics is graded automatically, you should write out detailed solutions to the homework problems. This will help you learn the material and will provide study material for the exams.

Quizzes: There will be regular quizzes in this course which should allow you to see how well you are doing in learning the course material. In general, the quizzes will be 1-2 conceptual questions followed by one long-answer problem solving question. Your 4 best quiz grades will each be worth 5% of the final grade (20% in total).

Exams: There will be three exams plus a final for this class, the best 3 of the 4 exams will count towards your grade. If you end up with 2 EXCUSED (they must be excused in advance which is only done in exceptional circumstances) absences from the exam, the remaining 2 exams will count for your exam grade.

For the exams you will be allowed to use the textbook for this course and your notes. You may not use any other books, notes, web pages, or help of people on the exams. You will be asked to sign an honor pledge attesting to your having used only the allowed resources.

Attendance and Participation: *You are expected to attend and participate in all class sessions.* Attendance and participation will be judged by the number of responses to the poll everywhere questions (you get credit for answering not for whether they are right or wrong). Attending an exam review session will allow you to make up an attendance point up to 4 (1 for each exam).

Office Hours and LA review sessions: Make use of the office hours and learning assistant review sessions to help you learn this material (you should be visiting office hours in ALL of your classes). If my office hours do not work with your schedule let me know and we can meet by appointment.

Grading: There is generally no late or make-up work allowed in this class. I drop multiple scores in each category to deal with any issues that may arise. If a *long-term* issue arises including you or a family member getting sick (NOT a one-time problem), let me know as soon as possible to we can determine what accommodation can be made.

Homework	10% (best 10 of 13)
Tutorials	15% (best 10 of 12)
Quizzes	20% (best 4 of 5 – 5% each)
Exams (3 exams + cumulative final)	45% (15% each – best 3 out of 4)
Attendance and Participation in group work	10%
Extra Credit Assignments (graded)	(2% each for up to 10%)
Total	100% (110%)

Grading Scale:

A	92 – 100	A-	87 – 91.9		
B+	82 – 86.9	B	77 – 81.9	B-	72 – 76.9
C+	65 – 71.9	C	60 – 64.9		
D	50 – 59.9				
F	< 50				

Honor Code: I take the honor code very seriously. You make talk with other students about homework and tutorial questions, but you are expected to complete assignments yourself and submit your own work. On exams you may not get help from texts, web sites of any kind, or other people.

To promote a stronger sense of mutual responsibility, respect, trust, and fairness among all members of the George Mason University Community and with the desire for greater academic and personal achievement, we, the student members of the university community, have set forth this Honor Code: Student Members of the George Mason University community pledge not to cheat, plagiarize, steal, or lie in matters related to academic work.

Do not use solutions from the instructor's solution manual or the internet in solving your homework problems, it is considered a violation of the honor code. Giving or receiving assistance on exams or quizzes, sharing calculators, wearing earbuds/headphones or using a cell phone or other wireless device during exams will be considered a violation of the Honor Code. [See: http://academicintegrity.gmu.edu/honorcode]

Academic Accommodations: *If you are a student with a disability and you need academic accommodations, please see me* ***and*** *contact the Office of Disability Resources at 703-993-2474. All academic accommodations must be arranged through that office.*

Schedule of Classes: This is a rough schedule detailed week-by-week information is under course content on Blackboard. If you cannot make it to a class you must find out what you missed from one of your classmates (the instructor and learning assistants are not here to tell you what you missed). The schedule is subject to change.

Week #	Date	Reading	Classwork	Work deadlines/Assessment
1	Aug 22	Ch 21.1 – 21. 2	Introductions / Vector problems	

	Aug 24	Ch 21.3 – 21.4	Force Problems	Sunday Aug 28 deadlines: Tut #1: E-force tutorial Hw #1: Physics primer + Coulomb's Law
2	Aug 29	Ch 21.5 – 21.6	E-field Problems	Quiz #1
	Aug 31	problem solving	Continuous Charge Problems	Sunday Sept 4 deadlines: Tut #2: E-field & continuous charge tutorial Hw #2: E-fields and continuous charge distribution E-field Extra credit
3	Sept 5	No Monday class, Labor Day		
	Sept 7	Ch 22.1 – 22.2	Flux Problems	Sunday Sept 11deadlines: Hw #3: Flux probs
4	Sept 12	Ch 22.3 – 22.4	Gauss's Law Probs	
	Sept 14	Ch 22.5	Gauss's Law Probs	Sunday Sept 18 deadlines: Tut #3: Gauss's Law tutorial Hw #4: Gauss's Law Gauss's Law extra credit
5	Sept 19	Ch 23.1 – 23.2	PE Problems	Quiz #2
	Sept 21	Ch 23.3	Potential problems	Sunday Sept 25 deadlines: Tut #4: Electric Potential Hw #5: Potential
6	Sept 26	Review		
	Sept 28	Exam #1; Ch 21 – 23		
7	Oct 3	Ch 24.1 – 24.2	Capacitor problems	
	Oct 5	Ch 24.3 – 24.4	Capacitor energy	Monday Oct 10 deadlines: Tut #5: Capacitance tutorial Hw #6: Capacitance
8	Oct 10	No Monday class – Fall Break		
	Oct 11	Ch 25.1 – 25.3	Current+resistance	Monday classes meet Tuesday
	Oct 12	Ch 25.4 – 25.6	Current+resistance	Sunday Oct 16 deadlines: Tut #6: Current/EMF tutorial Hw #7: Current/EMF
9	Oct 17	Ch 26.1 – 26.2	DC circuits	Quiz #3
	Oct 19	Ch 26.3 – 26.5	DC circuits	Sunday Oct 23 deadlines: Tut #7: DC current tutorial Hw #8: DC current
10	Oct 24	Exam #2: Ch 24 – 26		
	Oct 26	Ch 27.1 – 27.3	Magnetic fields	Sunday Oct 30 deadlines: Tut #8: Magnetic fields I Hw #9: Magnetic fields
11	Oct 31	Ch 27.4 – 27.5	Moving charges in magnetic fields	Halloween, Boo!

	Nov 2	Ch 27.6 – 27.7	Forces on conductors	<u>Sunday Nov 8 deadlines:</u> Tut #9: Magnetic fields II Hw #10: Magnetic fields II Magnetism I extra credit
12	Nov 7	Ch 28.1 – 28.5	Field of moving charges	Quiz #4
	Nov 9	Ch 28.6 – 28.7	Ampere's Law	<u>Sunday Nov 15 deadlines:</u> Tut #10: Magnetic fields III Hw #11: Magnetic fields III
13	Nov 14	Ch 29.1 – 29.5, 29.7	Motional EMF/ induced fields	Quiz #5
	Nov 16	Ch 29.1 – 29.5, 29.7	Motional EMF/ induced fields	<u>Sunday Nov 22 deadlines:</u> Tut #11: Motional EMF/induced fields tutorial Hw #12 Motional EMF/ induced fields Magnetism II extra credit
14	Nov 21	Exam #3: Chapters 27 – 29		
	Nov 23	Happy Thanksgiving		
	Nov 27			
15	Nov 28	Ch 30.1 – 30.3	RL Circuits	
	Nov 30	Ch 30.4 – 30.6	RL Circuits	<u>Sunday Dec 6 deadlines:</u> Tut #12: RL circuits Hw #13 RL Circuits
	Dec 7	Final Exam 1:30-4:15: All chapters (cumulative)		