# **PHYS 212: Physics for Science and Engineering II** Fall 2023

Instructor:	Dr. Matthew Route (mproute@olemiss.edu)		
<b>Office Hours:</b>	T/R 10:00-11:00 am, or by appointment in Lewis 121B		
Website:	https://physics.olemiss.edu/route/		
Lectures:	T/R 8:00 am – 9:15 pm, Lewis 101		
Textbooks:	University Physics, Volume 2 (2021) by Ling, S.J., Sanny, J., & Moebs,		
	W. (ISBN 978-1938168161).		
	University Physics, Volume 3 (2021) by Ling, S.J., Sanny, J., & Moebs,		
	W. (ISBN 978-1938168185).		
Prequisites:	MATH 262 or (MATH 261 and PHYS 201), PHYS 211		
Corequisites:	PHYS 222: Lab Physics for Science and Engineering II		
Other Materials:	-WebAssign subscription.		
	-A scientific calculator that has trigonometric functions and can handle		
	scientific notation for labs and exams. This does not include a smartphone		
	calculator app.		
	-The Mechanical Universe episodes via YouTube.		
	- <u>CU PhET Interactive Simulations</u> .		

## **Course Description**

This course is the second part of a two-semester calculus-based treatment of introductory physics. Topics include electricity, magnetism, electromagnetic waves, and optics.

## **Course Objectives**

After taking this course, students should know and understand the following key concepts.

• The physical laws that underpin electricity, magnetism, and electromagnetic waves.

This course will emphasize the following critical thinking components.

- Problem solving that builds off first semester physics (mechanics) to understand electricity, magnetism, various types of circuits, and electromagnetic waves.
- Interpreting data and appraisal of evidence, especially within various theoretical frameworks.

Students will develop the following competencies by the conclusion of this course.

- Proficiency in using mathematics as a "language of science" to enable comparison and evaluation of objects, phenomenon, and theoretical frameworks.
- Proficiency in numerical problem solving.
- Proficiency in the application of unit analysis to quantitative reasoning.

Evaluation		<b>Grading Scale</b>	
Homework/ Classroom Activities	35%	93 to 100%	Α
Midterm Exam 1	20%	90 to <93%	A-
Midterm Exam 2	20%	87 to <90%	B+
Comprehensive Final Exam	25%	83 to <87%	В
		80 to <83%	B-
		77 to <80%	C+
		73 to <77%	С
		70 to <73%	C-
		60 to <70%	D
		<60%	F

Classroom activities will consist of group assignments, quizzes, and surveys. The final grade distribution for the class will be determined in accordance with department policy.

#### Policies

#### Course-specific Policies

*Attendance* is not mandatory, but is highly encouraged and strongly correlated with excellent performance in the course. During the first two weeks, scan your ID card before entering the lecture classroom. Classroom activities for credit will occur during many lecture sessions.

*Communications.* The best way to communicate with me is to send an email to the address given above that contains your course and section number in the subject line (please do not message me through Blackboard). I will respond within 48 hours during business days, and within 72 hours on weekends.

*Course Materials* will be posted to Blackboard. Modifications to the syllabus will be announced in class and revisions posted to Blackboard. Homework assignments, in-class activities, and their respective solutions will be posted to Blackboard.

*Technology Use in the Classroom.* In order to foster an environment conducive to learning, the usage of cell phones, tablets, laptops, etc. are prohibited during lectures, classroom activities, and exams unless otherwise noted. Numerous studies demonstrate that taking notes by hand leads to significantly better retention and recall of information than if notes are taken on an electronic device, because the physical act of writing provides a deeper processing of the information<sup>1</sup>. In addition, personal electronic devices tempt students with recreational, non-academic distractions<sup>2</sup>.

*Late and Missed Work.* You will lose 10% of an assignment's value for each day it is late, up to a limit of one week. After that time, assignments may be turned in and evaluated for correctness, but a score of zero will be assigned. No make-up exams will be given unless arrangements are

<sup>&</sup>lt;sup>1</sup> Mueller, P. A., Oppenheimer, D. M. (2014). The Pen is Mightier than the Keyboard: Advantages of Longhand over Laptop Note Taking. Psychological Science, Vol 25, Issue 6, pp. 1159 -1168.

<sup>&</sup>lt;sup>2</sup> Kraushaar, J. M., Novak, D. C. (2010). Examining the Effects of Student Multitasking with Laptops During the Lecture. Journal of Information Systems Education, 21, 241–251.

made in advance. The final exam will only be administered at the date and time assigned by the registrar's office (see schedule below), and no alternative test times will be made available for it.

*Grade Disputes.* You may dispute your grades on classroom activities, homework, and the previous exam (if any) up until the corresponding midterm exam, but not afterwards. For example, grades received on the first midterm exam, activities, and homework covering chapters 5-8 may be disputed prior to the exam on 19 September, but not afterwards. This will facilitate your learning and not getting too far behind on material, while expediting the delivery of accurate grades.

## Course Tips.

- When studying for this course, set your smartphone and computer aside, unless you are using the digital version of the textbook. Do as much reading and problem-solving on paper before going to any electronic device. You will find your ability to understand and retain information improves by leaps and bounds.
- Show all your work. For calculations, start with the algebraic equation and show your steps. Showing steps allows partial credit to be given even if the final answer is wrong.
- Include units. There is a huge difference between 10 nm, 10 m, and 10 km.
- Label diagrams and axes on plots.

### University-wide Policies

*Academic Conduct.* You are encouraged to cooperate with your classmates and discuss course materials. However, dishonesty, cheating, plagiarism, or knowingly furnishing false information to the university in any way are regarded as serious offenses. Submission of products derived from artificial intelligence resources (e.g., ChatGPT) as one's own work will be construed as plagiarism. Students are responsible for knowing and adhering to the academic integrity policy of the University of Mississippi listed in the <u>Student Academic Conduct and Discipline Policy</u>. Students who violate academic integrity policies will be subject to the appropriate sanctions.

*COVID-19/ Infectious Diseases Policy*. If students test positive for COVID-19 at any health care facility, they must <u>report it to the Student Health Center</u> (or call 662-915-7274). Students with COVID-19 should follow the CDC's <u>COVID-19 exposure guidelines</u>, seek medical attention by a healthcare provider, and contact their instructor to let them know that they will be missing class due to a health-related issue.

If you need to isolate due to contracting COVID-19 at any point this semester, email me and your TA as soon as possible. We will determine how best to help you continue your progress in the course. You will have access to texts, course content, and our Blackboard course site. The <u>University Health Center COVID-19 FAQs</u> provides more information on isolation protocols, as does the CDC's <u>Isolation and Precautions</u> website.

*Non-Discrimination Policy.* It is the policy of the University of Mississippi not to discriminate against anyone on the basis of race, color, religion, sex, national origin, handicap, age, sexual orientation or being a veteran. Students are encouraged to freely examine and exchange diverse ideas both inside and outside the classroom.

*Disability Access and Inclusion.* The University of Mississippi is committed to the creation of inclusive learning environments for all students. If there are aspects of the instruction or design of this course that result in barriers to your full inclusion and participation, or to accurate assessment of your achievement, please contact the course instructor as soon as possible. Barriers may include, but are not necessarily limited to, timed exams and in-class assignments, difficulty with the acquisition of lecture content, inaccessible web content, and the use of non-captioned or non-transcribed video and audio files. If you are registered with SDS, you must log in to your <u>Rebel Access portal</u> to request approved accommodations. If you are NOT registered with SDS, you may <u>apply for disability services</u>.

*Verification of Class Attendance*. The University requires that all students have a <u>verified</u> <u>attendance/participation</u> at least once during the first two weeks of the semester for each course. Students without verified attendance will be dropped from the course and their financial aid amended accordingly.

Date	Topic and Events	Textbook	Mechanical
			Universe
22 Aug	Electric Charge, Coulomb's Law	5.1-5.3	27, 28
24 Aug	Electric Fields	5.4-5.7	29
28 Aug	Gauss's Law	6.1-6.2	
30 Aug	Conductors	6.3-6.4	
5 Sept	Electric Potential Energy	7.1-7.3	30
7 Sept	Fields from Potentials, Applications of Electrostatics	7.4-7.6	31
12 Sept	Capacitors	8.1-8.2	
14 Sept	Dielectrics	8.3-8.5	
19 Sept	Midterm Exam 1	5-8	
21 Sept	Electrical Current	9.1-9.3	32, 33
26 Sept	Resistance, Electrical Energy, Power	9.4-9.6	
28 Sept	Electromotive Force, Kirchhoff's Rules	10.1-10.3	
3 Oct	RC Circuits	10.4-10.6	
5 Oct	Magnetic Fields	11.1-11.4	34, 35
	9 Oct Deadline to Withdraw		
10 Oct	Force, Torque, the Hall Effect, and Applications	11.5-11.7	36
12 Oct	The Biot-Savart Law, Magnetic Force	12.1-12.3	
17 Oct	Ampere's Law, Solenoids, Magnetism in Matter	12.4-12.7	
19 Oct	Faraday's Law, Motional EMF	13.1-13.3	
24 Oct	Induced Electric Fields, Electromagnetic Induction	13.4-13.7	37
26 Oct	Midterm Exam 2	9-12	
31 Oct	Mutual and Self Inductance	14.1-14.3	
2 Nov	RL, RLC Circuits	14.4-14.6	
7 Nov	AC Circuits	15.1-15.2	38
9 Nov	Power and Resonance in AC Circuits	15.3-15.6	
14 Nov	Electromagnetic Waves	16.1-16.5	39

## **Tentative Schedule**

16 Nov	The Nature of Light	1.1-1.7	
21/23 Nov	Thanksgiving Break	-	
28 Nov	Geometric Optics	2.1-2.8	40
30 Nov	Interference and Diffraction	3.1-4.7	41
5 Dec	Final Exam (8:00 am, Lewis 101)	Everything	

## **Additional Resources**

• <u>Science News</u> website. Learn about news across the sciences, including physics, by signing up to their free email newsletter delivered once a week on Thursday.