Marshall University

College of Science

Department of Physics

PHY 300

Electricity and Magnetism

Fall 2018

Instructor: Dr. André Wehner, Science 255, [wehnera@marshall.edu](mailto:wehnera@marshall.edu), 304.696.2755

Office Hours: MW 9:00-11:00, 4:00-6:00, or by appointment.

Class: TTh 8:00-9:15, Science 281.

Text: *Introduction to Electrodynamics, 4th edition*, David J. Griffiths

Grading: 4 tests @ 15% each = 60%

Final 25%

Homework 15%

*No extra credit assignments will be given and the lowest score will not be dropped.*

The grading scale will be as follows:

A: ≥ 90% B: ≥ 80% C: ≥ 70% D: ≥ 60%

**Course Description**

*From the catalog:* A course including the study of electrostatics, magnetostatics, electromagnetic induction, introduction to Maxwell's equations and electromagnetic waves. 3 lec. PR: PHY213 and MTH231.

This course is a continuation of PHY213, which already gave you an introduction to electricity and magnetism. We shall now approach the same topics from a more theoretical, geometric point of view. One of our goals is to motivate the introduction of special relativity, field theory, and gauge theory, another is to prepare you sufficiently for graduate studies in physics.

We will spend quite some time on chapter 1 in our textbook, the mathematical introduction, because you may not have seen this material in other courses. The mathematical methods that will be most important in this class are vector calculus in rectangular and curvilinear coordinates (including integral theorems), partial differential equations, orthogonal functions (including Legendre polynomials and Fourier series), and delta functions.

We will then cover all the topics that are traditionally part of a first semester of a two-semester E&M course: electrostatics (Ch. 2), with special techniques (Ch. 3) and applied to fields in matter (Ch. 4), magnetostatics in vacuum (Ch. 5) and matter (Ch. 6).

A successful student should be able to analyze a wide variety of theoretical constructs and real-world situations. See page 3 of this syllabus for a list of learning outcomes for this course. A successful student should also be familiar with computational software such as *Mathematica*, one of many analytical tools used in professional physics research.

The traditional lecture portion of the course is where course material is to be reinforced, not introduced. As such, **you are expected to have read the assigned portion before arriving to class**. Students have reported night-and-day levels of understanding during lectures before which they read the topic covered. The class, being a small one, is expected to be informal to some degree, so class participation is highly encouraged. Assignments will be due at announced dates; some will require the use of *Mathematica*. Homework is exceedingly important for developing understanding of course material, not to mention building skills in complex physical and mathematical problem solving. They will require considerable time and personal effort! **Collaboration, being an essential skill in science and engineering, is encouraged, but work submitted must be completely original.** Social interactions are critical to scientists’ success—most good ideas grow out of discussions with colleagues, and essentially all physicists work as part of a group. However, it is important that you **own** the material. I suggest you start homework by yourself—making an extended effort on *every* problem—*then* work as a group, and finally finish up on your own, writing up your own work in your own way. There will also be some time for peer discussion in classes. As you work together, try to help your classmates get over confusions, listen to them, ask them questions, critique, teach each other. You will learn a lot this way!

Class attendance is vital to your understanding of the subject. If you miss four classes (excused or unexcused), your final grade may be dropped by a letter grade. If you miss eight or more, you may automatically receive a failing grade for the course.

I expect you to be on time, prepared for class and to actively participate in the class discussion every day – being prepared means at the very least doing your homework, reading the sections, and looking over notes from previous classes.

Attendance will be recorded, but will not be counted explicitly in the grade. **Four unexcused absences will result in a lowering of the grade. If you miss more than ten classes (excused and unexcused), you will receive a failing grade.**

Homework is an essential part of this course. You are expected to spend several hours each week on homework.

There will be four tests during the course of the term, plus a comprehensive final. The questions on these will remotely resemble the questions from the homework. The solutions you present must be complete, coherent, and well-organized. You must show all work for full credit. Points will be taken off for missing or incorrect units in the answer as well as incorrect numbers of significant digits.

If you have to miss a test for a valid reason (proof required!), you will be allowed to make it up. If you know in advance you will have to miss a test, you should make arrangements to take it early.

By enrolling in this course, you agree to the University Policies listed below. The full text of each policy is at <http://www.marshall.edu/academic-affairs/policies> .

Academic Dishonesty/ Excused Absence Policy / Computing Services Acceptable Use/ Dead Week/ Inclement Weather/ Students with Disabilities/ Academic Forgiveness/ Academic Probation and Suspension/ Academic Rights and Responsibilities/ Affirmative Action/ Sexual Harassment

The expectation at MU is that the principles of truth and honesty will be rigorously followed in all academic endeavors. This assumes that all work will be done by the person who purports to do the work without unauthorized aids. In addition, when making use of language and some idea not his or her own, whether quoting them directly or paraphrasing them into his or her own words, the student must attribute the source of the material in some standard form, such as naming the source in the text or offering a footnote. University policies are described in detail at: <http://www.marshall.edu/academic-affairs/?page_id=802>.

Marshall University is committed to equal opportunity in education for all students, including those with physical, learning and psychological disabilities.  University policy states that it is the responsibility of students with disabilities to contact the Office of Disabled Student Services (DSS) in Prichard Hall 117, phone 304 696-2271 to provide documentation of their disability.  Following this, the DSS Coordinator will send a letter to each of the student’s instructors outlining the academic accommodation he/she will need to ensure equality in classroom experiences, outside assignment, testing and grading.  The instructor and student will meet to discuss how the accommodation(s) requested will be provided.  For more information, please visit <http://www.marshall.edu/disabled> or contact Disabled Student Services Office at Prichard Hall 11, phone 304-696-2271.

Schedule (tentative)

|  |  |  |
| --- | --- | --- |
| Week | Day | Material covered (chapter) |
|  |  |  |
| 1 | 8/21 | 1: Math background |
|  | 8/23 | 1 |
| 2 | 8/28 | 1 |
|  | 8/30 | 1 |
| 3 | 9/4 | 1 |
|  | 9/6 | Test 1 |
| 4 | 9/11 | 2: Electrostatics |
|  | 9/13 | 2 |
| 5 | 9/18 | 2 |
|  | 9/20 | 2 |
| 6 | 9/25 | 3: Special Methods |
|  | 9/27 | 3 |
| 7 | 10/2 | 3 |
|  | 10/4 | 3 |
| 8 | 10/9 | Test 2 |
|  | 10/11 | 4: Electrostatics in Media |
| 9 | 10/16 | 4 |
|  | 10/18 | 4 |
| 10 | 10/23 | 4 |
|  | 10/25 | 5: Magnetostatics |
| 11 | 10/30 | 5 |
|  | 11/1 | 5 |
| 12 | 11/6 | 5 |
|  | 11/8 | Test 3 |
| 13 | 11/13 | 6: Magnetostatics in Media |
|  | 11/15 | 6 |
| 14 | 11/27 | 7: Electrodynamics |
|  | 11/29 | 7 |
| 15 | 12/4 | 7 |
|  | 12/6 | Test 4 |
|  | 12/13 | Final |

*Disclaimer*: The above schedule, policies, procedures, and assignments in this course are subject to change in the event of extenuating circumstances, by mutual agreement, and/or to ensure better student learning.