

# **PHYS 345: Electricity and Magnetism I**

## **Fall 2014**

Teacher: Dr. Kelly Kriebel Office: Room 109, Collier Hall of Science Phone: ext. 1437 e-mail: <a href="mailto:kriebelk@moravian.edu">kriebelk@moravian.edu</a>	Classroom: CHS 123 M,W,F 7:50-8:40am
	Lab: CHS 107 M 1:00-4:00
	Office Hours: MWF 11-12

### **Goals of the course:**

The primary aim of this course (and its second semester counterpart PHYS346) is to provide students with a working knowledge of the concepts of electromagnetism and to prepare them for graduate school or industry. This first semester course will concentrate on electrostatics and the fields of stationary charge distributions and steady currents. Since electromagnetic theory uses the idea of the vector field, students will learn the mathematics of vectors and vector operators. Students will be able to determine the electric field for a variety of charge/conductor/insulator distributions using a number of different techniques: Coulomb's and Gauss's Law, Laplace's and Poisson's equations, the method of images, energy concepts, and numerical techniques. In the laboratory portion of the course, the students will learn a variety of experimental techniques that will complement the theoretical ideas introduced throughout the course.

**Course Text:** Introduction to Electrodynamics, 3rd ed., Griffiths

### **Course Content and Schedule of Topics:**

<i>Topic</i>	<i>Approximate Time Span</i>	<i>Readings</i>
Course introduction and review of Physics 111-112	1 day	PHYS112 notes
1. Vectors a. Vector operations b. Div, Curl, Grad, Laplacian c. Divergence Theorem, Stokes Theorem d. Coordinate systems	1 week	1.1-1.4
2. Electrostatics a. Coulomb's law b. Electric field, potential c. Gauss' Law	1 week	2.1-2.2
3. Laplace and Poisson equations a. Charge distributions b. Conductors	1 week	3.1, 2.5
4. The electric dipole and multipoles	1 week	3.4
5. Electric potential a. Energy density b. Forces on conductors c. Capacitors	1 week	2.3
6. Electric polarization a. Electric Susceptibility b. Electric Displacement c. Interior and exterior fields	1 week	4.1
7. Charge distributions and dielectrics a. Potential energy b. Forces c. Boundary conditions	4 weeks	4.2-4.4
8. Method of Images a. Uniqueness theorem b. Complex variables c. Solutions to Laplace's equation	3 weeks	3.2
9. Coordinate Systems and Boundary Conditions	1 week	3.3

**Grading Policy:**

A = 90%-100%

B = 80%-89%

C = 70%-79%

D = 60%-69%

F = below 60%

<b>Assessment:</b>	<b>% Weight</b>
Homework Problems	30
Labs	30
Quizzes	20
Final Exam	20

**Homework Problems:**

As indicated above, the problem sets constitute a major portion of your grade. Your work on these problem sets will be bound by the Moravian College Policy on Academic Honesty in the Student Handbook. The due dates for each assignment will be stated when the assignment is handed out. There will be a 50% deduction for tardy work up until solutions to the homework are posted in the periodical room (CHS 117). Work submitted after that time will receive a zero.

**Labs:**

We will meet every week for lab, although we will probably not do a lab every week. Data will be collected and you will be responsible for data analysis, calculations and conclusions drawn from the data. In addition, I will periodically utilize the lab session to review problem sets and give quizzes.

**Quizzes:**

Approximately every two weeks a quiz of one or two problems will be given at the beginning of the laboratory period.

**Final comprehensive exam:**

An exam on all material covered during the semester.

**Attendance Policy:**

Students are expected to come to class. To that end, I WILL take attendance, and reserve the right to raise/lower your grade based on your attendance.

Students who wish to request accommodations in this class for a disability must contact Ms. Elaine Mara, assistant director of academic support services for academic and disability support, at the lower level of Monocacy Hall, or by calling [610-861-1401](tel:610-861-1401). Accommodations cannot be provided until authorization is received from the Academic Support Center. The Writing Center is located in a building that is not accessible to persons with mobility impairments. If you need the services of the Writing Center, please call 610-861-1392.

Good luck in the coming year. I will welcome any suggestions for improving the course. Since I am looking for you to do your best work, you should demand excellence from me as well.

Subject to revision