PHYS346: Electric and Magnetic Fields II
Spring 2015

Teacher: Dr. Kelly Krieble Office: Room 109, Collier Hall of Science Phone: ext. 1437 e-mail: krieblek@moravian.edu	Classroom: CHS 123 M,W,F 9:10-10 CHS 108 T 12:45-3:45
	Office Hours: MWF 8-9am

Goals of the course:

The primary aim of this course is to provide students with a working knowledge of the concepts of electromagnetism and to prepare them for graduate school or industry. This course will concentrate on magnetostatics, electrodynamics, and electromagnetic waves and wave theory. Students will be able to determine the magnetic field for a number of current distributions using a variety of techniques. Students will be introduced to the vector potential as well as its properties. In addition, Maxwell's equations will be developed and used to solve a number of problems. Magnetic materials will also be discussed. In the laboratory portion of the course, the students will learn and use a variety of experimental techniques that will complement the theoretical ideas introduced throughout the course.

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

Course Content and Schedule of Topics:

Topic	*Approximate Time Span*	*Readings*
1. Course introduction and review of Physics 111-112 a. Force on a moving charge b. Biot Savart law c. Flux d. Hall Effect	1 day	PHYS112 notes Sections 5.1, 5.2
2. B field properties	1 week	Sections 5.1, 5.2
3. Vector potential A and its properties		Section 5.4
4. Ampere's circuital law a. Solenoid b. Current sheets c. Boundary Conditions	1 week	Section 5.3
5. The magnetic dipole	1 week	Section 5.4
6. Faraday's law of induction	1 week	Chapter 7
7. Energy, torque, and magnetic pressure	1 week	
8. Inductance a. Mutual and self b. Circuit examples		Section 7.2
9. Magnetic materials	1 week	Section 6.1
10. Electromagnetic waves a. Maxwell's equations b. Brief review of waves c. Poynting vector d. Plane EM waves in free space e. Applications of plane wave results f. TEM waves	5 weeks	Sections 7.3, 8.2 Chapter 9
11. Complex plane waves	1 week	
12. Retarded potential	1 week	Chapter 10
13. Electric dipole radiation	1 week	Chapter 11

Grading Policy:

A = 90%-100%
B = 80%-89%
C = 70%-79%
D = 60%-69%
F = below 60%

Note: It is within the instructor's purview to apply qualitative judgment in determining grades for an assignment or for the course.

Assessment:	% Weight
Homework Problems	20
Labs	30
Project	15
Quizzes	20
Final Exam	15

Homework Problems:

As illustrated 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. The due dates for each assignment will be stated when the assignment is handed out. Problem sets handed in prior to the due date will receive no deduction for tardiness. There will be a 50% deduction for tardy work up until solutions to the homework are posted. Work submitted after that time will receive a zero.

Project:

To augment your overall learning experience and provide an experimental, presentation, and poster aspect to the lab, you will be required to complete one project during the term. The project will involve the performance of an experiment from the list below, writing up a formal lab report, producing a poster, and giving a short presentation on the work accomplished.

1. Magnetic Damping
2. Magnetic Torque
3. Magneto-optic Kerr effect (MOKE)
4. Faraday Rotation
5. Franklin's Bells
6. Noise Fundamentals
7. LRC circuits
8. Faraday's Law

Labs:

The first several weeks will involve performing basic experiments in magnetic fields, with the end of the semester devoted to independent project work. Expect to attend the lab period every week, although the bulk of the experience will involve working at your own pace outside of the lab period.

Quizzes:

Approximately every two weeks a quiz 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 with Disabilities:

Students who wish to request accommodations in this class for a disability should contact Ms. Elaine Mara, Assistant Director of Academic & Disability Support, located on the first floor of Monocacy Hall (extension 1401). Accommodations cannot be provided until authorization is received from the Academic & Disability Support office.

The Writing 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. Should you have any comments about the class during the semester, please feel free to discuss them with me, 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