Phy362: Electricity, Magnetism and Waves II (3 hr) Spring 2016

Department of Physics and Engineering

Instructor: Dr. Paul D. Schmelzenbach	Meeting: 8:30-9:25 MWF (RS 219)
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Materials – *Introduction to Electrodynamics* by David Griffiths, 4rd edition. Published by Prentice Hall, 1999.

Description – Almost everything we experience is a result of interactions described by electrodynamics. Amazingly much of electrodynamics boils down to only four equations! During this second semester we will study various applications of Maxwell's equations particularly focusing on electromagnetic waves and relativity.

Learning Outcomes – This course supports the overall learning objectives of the physics and engineering programs to: develop an understanding of the fundamental principles of physics and apply physical principles, mathematical reasoning, and computational techniques to solve real-world problems

Within these broader outcomes, in this course you will

1. Translate a physical description of a junior-level E&M problem to a math equation necessary to solve it.
2. explain the physical meaning of the mathematical formulation
3. articulate the big ideas from each section
4. justify and explain your thinking and approach to a problem or physical situation in written or oral form
5. when appropriate for a given problem you should be able to predict your expectations of a problem (such as the direction of a field or dependence on distance) and in all cases evaluate the reasonableness of a solution.
6. be able to sketch the physical parameters of a system (such as the E or B field)
7. apply computational techniques to help in solving E&M problems
8. correctly apply problem solving techniques such as approximations, symmetries, integration and superposition

Homework – Homework is exceedingly important for developing an understanding of the course material, not to mention building skills in complex physical and mathematical problem solving. Remember that it is not just a "correct" solution that itself that is the true goal, it is the process to the solution that will develop your skill as a physicist or engineer. I encourage you to work together on the homework sets, but you must participate in the process of obtaining the solution to each problem. The guideline is that you should have no trouble explaining or repeating work that you turn in.

Submission format:

-Work the problem in clear logical steps. Solutions should be clear enough one of your peers could follow your steps if they had not worked the problem before.

-Neatly use pencil.

-Watch the details. For instance, always indicate vectors with a consistent notation: the electric field is **E** or $\vec{E}$ not just E (which indicates you mean just the magnitude).

-Does your answer make sense? Box your final answer.

-Provide at a minimum of one sentence evaluation of your answer.

Preclass questions Each class day there will be preclass questions to answer electronically. These will be due by midnight the evening before class. Your responses to preclass questions are graded on the following scale: 2=demonstrates reading/thinking; 1=room for improvement or late but before class, 0=unsatisfactory or submitted after class. For credit preclass questions must be submitted prior to class.

Exams – Four exams will follow chapter 8, chapter 9, chapter 10/11 and chapter 12. The final examination is scheduled for Friday, May 6 at 7:30 am.

Final Grades – The grade you earn in this course is based on the scale shown to the right. The points you receive during the course are weighted accordingly:

- Homework/Activities: 30%
- Preclass: 5%
- Tests (4): 40%
- Final Exam: 25%

A	100 - 91.0
A-	91.0 - 89.5
B+	89.5 - 87.0
B	87.0 - 81.0
B-	81.0 - 79.5
C+	79.5 - 77.0
C	77.0 - 71.0
C-	71.0 - 69.5
D+	69.5 - 67.0
D	67.0 - 61.0
D-	61.0 - 55.0

Course Calendar			
	Topics	Reading	Due
1/12	Review – volume integrals revisted		
1/13	Review – surface and line integrals revisited		Activity 1
1/15	Charge and Poynting Vector	8.1	Activity 2
1/18	No class meeting		
1/20	Maxwell Stress Tensor	8.2.1-8.2.2	Hmk 8.1
1/22	Conservation of Momentum	8.2.3-8.2-4	
1/25	Wrap up momentum	8.3	Hmk 8.2
1/27	Exam #1		
1/29	1-D waves	9.1.1-9.1.2	
2/1	BC and polarization	9.1.3-9.1.4	
2/3	EM plane waves	9.2.1-9.2.2	Hmk 9.1
2/5	Energy and Momentum in EM waves	9.2.3	
2/8	EM waves in matter I	9.3.1-9.3.2	Hmk 9.2
2/10	EM waves in matter II	9.3.3	
2/12	EM waves in conductors	9.4	
2/15	EM waves in conductors II	9.4	Hmk 9.3
2/17	Waves Guides	9.5	
2/19	Wave Guides II	9.5	
2/22	Exam #2		Hmk 9.4-9.5
2/24	Review of Potentials	10.1.1	
2/26	Gauge Transformations	10.1.2-10.1.3	
2/29	Retarded Potentials	10.2.1	Hmk 10.1
3/2	Jefimenko's Equation	10.2.2	
3/4	Lienard-Wiechert Potentials	10.3.1	Hmk 10.2
3/7	Spring Break		
3/9	Spring Break		
3/11	Spring Break		
3/14	Moving Point Charge	10.3.2	
3/16	Dipole Radiation Part 1	11.1.1-11.1.2	Hmk 10.3
3/18	Dipole Radiation Part 2	11.1.3-11.1.4	
3/21	Radiation From a Point Charge	11.2.1	
3/23	Radiation Reaction	11.2.2-11.2.3	
3/25	Easter Break		
3/28	Easter Break		
3/30	Wrap up and Review		Hmk 11
4/1	Exam #3		
4/4	Special Relativity Part 1	12.1.1-12.1.3	
4/6	Lorentz Transformations and Spacetime	12.1.3-12.1.4	
4/8	Special Relativity, 4 Vectors		
4/11	Relativistic Mechanics Part 1	12.2.1-12.2.2	Hmk 12.1
4/13	Relativistic Mechanics Part 2	12.2.3-12.2.4	
4/15	Relativistic Electrodynamics Part 1	12.3.1-12.3.2	Hmk 12.2
4/18	Relativistic Electrodynamics Part 2	12.3.3-12.3.4	
4/20	Relativistic Electrodynamics Part 3	12.3.5	
4/22	Wrap up Relativistic Electrodynamics	12.3.5	
4/25	Wrap-up and Review		Hmk 12.3
4/27	Exam #4		
4/29	Review		
5/7	Final Exam 7:30-10:00		

As with all courses at PLNU, this course supports the cause to provide higher education in a vital Christian community where minds are engaged and challenged, character is modeled and formed, and service becomes an expression of faith. Being of Wesleyan heritage, we aspire to be a learning community where grace is foundational, truth is pursued, and holiness is a way of life.

Academic Integrity – Students should demonstrate academic honesty by doing original work and by giving appropriate credit to the ideas of others. Academic dishonesty is the act of presenting information, ideas, and/or concepts as one's own when in reality they are the results of another person's creativity and effort. A faculty member who believes a situation involving academic dishonesty has been detected may assign a failing grade for that assignment or examination, or, depending on the seriousness of the offense, for the course. Faculty should follow and students may appeal using the procedure in the university Catalog. See Academic Policies for definitions of kinds of academic dishonesty and for further policy information.

Academic Accommodations – If you have a diagnosed disability, please contact PLNU's Disability Resource Center (DRC) within the first two weeks of class to demonstrate need and to register for accommodation by phone at 619-849-2486 or by e-mail at DRC@pointloma.edu. See Disability Resource Center for additional information.

Attendance – Regular and punctual attendance at all classes is considered essential to optimum academic achievement. If the student is absent from more than 10 percent of class meetings, the faculty member can file a written report which may result in de-enrollment. If the absences exceed 20 percent, the student may be de-enrolled without notice until the university drop date or, after that date, receive the appropriate grade for their work and participation. See Academic Policies in the Undergraduate Academic Catalog.

Final Exam – Successful completion of this class requires taking the final examination on its scheduled day. The final examination schedule is posted on the Class Schedules site.

FERPA Policy As a student at Point Loma, you have a legal right to privacy as outlined in the federal FERPA (Family Educational Rights and Privacy Act) legislation. See Policy Statements for full text.