Point Loma Nazarene University
Phy361: Electricity, Magnetism and Waves I (3 hr) Fall 2017

Department of Physics and Engineering

Instructor: Dr. Paul D. Schmelzenbach	Meeting: 7:25-8:20 MWF (RS219)
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Office Hours: 8:30-9:45; 12:15-1:15 MWF, by appt.	Office Location: RS 207

Materials – *Introduction to Electrodynamics* by David Griffiths, 4rd edition. Published by Prentice Hall, 1999. Access to MATLAB or similar program. Scientific Graphing Calculator.

Description – Classical electromagnetism including topics in electrostatics, magnetostatics, fields in matter, electromagnetic induction, and Maxwell's equations.

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

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. They will require considerable time and personal effort this term. Remember that it is not the 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. Late homework will not be accepted unless their is a documented emergency.

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 $\mathbf{E}$ or $\overrightarrow{E}$ not just E (which indicates you mean just the magnitude).

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

Collaboration: I expect and encourage collaboration between you and your peers while working on your homework. (Most good ideas come out of discussions with colleagues. This skill is highly valued by employers, and virtually all science and engineering takes place within groups or teams.) That being said, your work should be your *own original solution.* Allow adequate time to work and think about problems by yourself first before you work together with your peers or ask questions of me. The guideline is that you should have no trouble explaining or repeating work that you turn in.

Preclass questions – Each class day there will be three Preclass questions to answer electronically. These will be due by 9 pm the evening before class. Your responses to Preclass questions are graded on the following scale: 2=demonstrates reading/thinking; 1=room for improvement, 0=unsatisfactory. Late responses will not receive credit.

Exams – Two examinations will be given during the semester on October 9 and November 20. The written portion of the final examination is scheduled for Monday, December 16 at 7:30 am. Exams cannot be made up, unless under extreme circumstances discussed and arrangements made with the professor before the exam.

Quizzes – Through the semester there will be several quizzes that will be announced at a minimum of the previous class period. Quizzes cannot be made up, unless under circumstances discussed and arrangements made with the professor before the quiz. The lowest two quiz scores will not be included in the quiz portion of the grade.

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: 20%
- Preclass: 5%
- Tests (2): 30%
- Quizzes: 20%
- Final Exam: 25%

A	100 - 91.0
A-	91.0 - 89.5
B+	89.5 - 87.5
B	87.5 - 81.0
B-	81.0 - 79.5
C+	79.5 - 77.5
C	77.5 - 71.0
C-	71.0 - 69.5
D+	69.5 - 67.5
D	67.0 - 61.0
D-	61.0 - 57.0

University Mission: Point Loma Nazarene University exists to provide higher education in a vital Christian community where minds are engaged and challenged, character is modeled and formed, and service is an expression of faith. Being of Wesleyan heritage, we strive to be a learning community where grace is foundational, truth is pursued, and holiness is a way of life.

Department Mission: Within this broader mission, the Physics and Engineering Department at PLNU provides strong programs of study in the fields of Physics and Engineering. Our students are well prepared for graduate studies and careers in scientific and engineering fields. We emphasize a collaborative learning environment which allows students to thrive academically, build personal confidence, and develop interpersonal skills. We provide a Christian environment for students to learn values and judgment, and pursue integration of modern scientific knowledge and Christian faith.

Attendance– Attendance is expected at each class session. In the event of an absence you are responsible for the material covered in class and the assignments given that day. 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 http://catalog.pointloma.edu/content.php?catoid=24&navoid=1581#Class Attendance in the Undergraduate Academic Catalog.

Academic Honesty – 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 http://catalog.pointloma.edu/content.php?catoid=24&navoid=1581#Academic Honesty 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. For more details see the PLNU catalog: http://catalog.pointloma.edu/content.php?catoid=24&navoid=1581#Academic Accommodations. Students with learning disabilities who may need accommodations should discuss options with the instructor during the first two weeks of class.

Class Enrollment – It is the student's responsibility to maintain his/her class schedule. Should the need arise to drop this course (personal emergencies, poor performance, etc.), the student has the responsibility to follow through (provided the drop date meets the stated calendar deadline established by the university), not the instructor. Simply ceasing to attend this course or failing to follow through to arrange for a change of registration (drop/add) may easily result in a grade of F on the official transcript.

Credit Hour – In the interest of providing sufficient time to accomplish the stated course learning outcomes, this class meets the PLNU credit hour policy for a 3 unit class delivered over 16 weeks. Specific details about how the class meets the credit hour requirements can be provided upon request.

Final Exam – The final exam date and time is set by the university at the beginning of the semester and may not be changed by the instructor. This schedule can be found on the university website and in th course calendar. No requests for early examinations will be approved. Only in the case that a student is required to take three exams during the same day of finals week, is an instructor authorized to consider changing the exam date and time for that particular student.

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	Topics	Reading
8/30	Introductions	
9/1	Vector Algebra	1.1
9/4	Differential Calculus	1.2
9/6	Integral Calculus	1.3
9/8	Curvilinear Coordinates	1.4
9/11	Dirac Delta Function; Theory of Vector Fields	1.5
9/13	The Electric Field	2.1
9/15	Divergence and Curl of Electrostatic Fields	2.2
9/18	Electric Potential I	2.3
9/20	Electric Potential II	2.3
9/22	Work and Energy in Electrostatics	2.4
9/25	Conductors	2.5
9/27	Capacitors	2.5
9/29	Laplace's Equation 1	3.1
10/2	Laplace's Equation 2	3.1-2
10/4	Method of Images	3.2
10/6	Wrap up and Review	
10/9	Exam #1	
10/11	Separation of Variables	3.3
10/13	Multipole Expansion/Separation of Variables	3.4
10/16	Multipole Expansion	3.4
10/18	Polarization	4.1, 4.2
10/20	Fall Break	
10/23	The Electric Displacement	4.2, 4.3
10/25	Linear Dielectrics	4.4
10/27	The Lorentz Force	5.1
10/30	Biot-Savart Law	5.2
11/1	Divergence and Curl of B 1	5.3
11/3	Divergence and Curl of B 2	5.3
11/6	Magnetic Vector Potential 1	5.4
11/8	Magnetic Vector Potential 2	5.4
11/10	Magnetization	6.1
11/13	Field of Magnetized Objects	6.2
11/15	Auxiliary Field	6.3
11/17	Linear and non-linear media	6.4
11/20	Exam #2	
11/22	Thanksgiving	
11/24	Thanksgiving	
11/27	EMF	7.1
11/29	EMF	7.1
12/1	Electromagnetic Induction	7.2
12/4	Electromagnetic Induction	7.2
12/6	Maxwell's equations 1	7.3
12/8	Maxwell's equations 2	7.3
12/10	Final Exam	