POINT LOMA
NAZARENE UNIVERSITY

Department of Physics and Engineering, Point Loma Nazarene University
EGR/PHY 3063 – Electricity, Magnetism & Waves I – 3 Units – Fall 2023

Instructor: Professor J. David Nichols
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Office Hours: TBD, and by appointment

Lecture: MWF 7:25 – 8:20 am, Rohr Science 365
Final Exam: 7:30 – 10:00 am, Monday, December 11, 2023

Required Textbook and Study Resources

- *Introduction to Electrodynamics, 4th Edition,* by David Griffith
- Access to MATLAB or similar program
- A scientific graphing calculator

Course Description: Classical electromagnetism including topics in electrostatics, magnetostatics, fields in matter, electromagnetic induction, and Maxwell's equations. Prerequisites: PHY 2054 with a grade of C- or higher and MTH 2074 with a grade of C- or higher. Recommended: MTH 3033

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

ASSESSMENT AND GRADING

Graded Components

- **Pre-Class:** In preparation for each class meeting there is a reading assignment. To be ready for group work and higher-level learning, these reading assignments are very important to help you come prepared to class. To complete the reading assignment, you must answer a few questions and submit them electronically through Canvas by 11:59 pm the night before class. Late submissions will not be accepted. This electronic communication is so important because it is your voice in what material we emphasize during class meetings and provides me constant feedback of your understanding of the material. These submissions will be graded on the following scale: 2 = demonstrates reading, 1 = room for improvement, 0 = unsatisfactory. These points are accumulated and are worth 5% of the final grade. The lowest 4 scores will be dropped.

- **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 there is a documented emergency. Each homework assignment is worth 30 points.

  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.

  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 take 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.

- **Examinations and Final Examination:** There will be two in-class exams during the semester and one comprehensive final exam. All exam dates are indicated in the course calendar in the syllabus. Exams will be closed book, but a sheet of formulas will be provided to you to use during your exam. Partial credit will be given for correct reasoning at any step of a problem, but only if it is communicated clearly enough for me to understand. For problems that call for solution or explanation, no credit will be given for an answer alone; the method or reasoning must also be shown. Exams are to be taken at the time indicated in the syllabus unless other arrangements are made in advance with the professor for some unavoidable circumstance, and otherwise cannot be

made up. You must take ALL the exams in order to pass the class. **Final Examination Policy:** Successful completion of this class requires taking the final examination **on its scheduled day (Monday December 11th, 2023, 7:30 – 10:00 am)**.

Grading Scale

- Your course grade will be based on the following:

• **Component**	• **Weight**
• Pre-Class	• 10%
• Homework	• 30%
• Tests (2)	• 30% (equally weighted)
• Final Exam	• 30%

- **Grading Scale:** The letter grade you will earn in this course is based on the following:

Standard Grade Scale Based on Percentages

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F
S≥ 91.5	91.5 >S≥ 89.5	89.5 >S≥ 87.5	87.5 >S≥ 81.5	81.5 >S≥ 79.5	79.5 >S≥ 77.5	77.5 >S≥ 71.5	71.5 >S≥ 69.5	69.5 >S≥ 67.5	67.5 >S≥ 61.5	61.5 >S≥ 59.5	S < 59.5

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. If you find yourself scheduled for three (3) or more final examinations on the same day, you are authorized to contact each professor to arrange a different time for one of those exams. However, unless you have three (3) or more exams on the same day, no requests for alternative final examinations will be granted.

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 15 weeks. It is anticipated that students will spend a minimum of 37.5 participation hours per credit hour on their coursework. For this course, students will spend an estimated 112.5 total hours meeting the course learning outcomes. The time estimations are provided in the Canvas modules.

PLNU MISSION

To Teach ~ To Shape ~ To Send

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

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.

STATE AUTHORIZATION

State authorization is a formal determination by a state that Point Loma Nazarene University is approved to conduct activities regulated by that state. In certain states outside California, Point Loma Nazarene University is not authorized to enroll online (distance education) students. If a student moves to another state after admission to the program and/or enrollment in an online course, continuation within the program and/or course will depend on whether Point Loma Nazarene University is authorized to offer distance education courses in that state. It is the student's responsibility to notify the institution of any change in his or her physical location. Refer to the map on State Authorization to view which states allow online (distance education) outside of California.

PLNU COPYRIGHT POLICY

Point Loma Nazarene University, as a non-profit educational institution, is entitled by law to use materials protected by the US Copyright Act for classroom education. Any use of those materials outside the class may violate the law.

PLNU ACADEMIC HONESTY POLICY

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.

PLNU ACADEMIC ACCOMMODATIONS POLICY

PLNU is committed to providing equal opportunity for participation in all its programs, services, and activities. Students with disabilities may request course-related accommodations by contacting the Educational Access Center (EAC), located in the Bond Academic Center (EAC@pointloma.edu or 619-849-2486). Once a student's eligibility for an accommodation has been determined, the EAC will issue an academic accommodation plan ("AP") to all faculty who teach courses in which the student is enrolled each semester.

PLNU highly recommends that students speak with their professors during the first two weeks of each semester/term about the implementation of their AP in that particular course and/or if they do not wish to utilize some or all of the elements of their AP in that course.

Students who need accommodations for a disability should contact the EAC as early as possible (i.e., ideally before the beginning of the semester) to assure appropriate accommodations can be provided. It is the student's responsibility to make the first contact with the EAC.

PLNU ATTENDANCE AND PARTICIPATION POLICY

Regular and punctual attendance at all class sessions is considered essential to optimum academic achievement. If the student is absent for more than 10 percent of class sessions, the faculty member will issue a written warning of 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.

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.

SPIRITUAL CARE

Please be aware PLNU strives to be a place where you grow as whole persons. To this end, we provide resources for our students to encounter God and grow in their Christian faith.

If students have questions, a desire to meet with the chaplain or have prayer requests you can contact the Office of Spiritual Development.

EGR/PHY3063: Electricity, Magnetism Waves I (Fall 2023)

(Tentative Syllabus, Subject to Updates)

Date	Topic	Reading
M 08/28/23	Introduction	
W 08/30/23	Vector Algebra	1.1
F 09/01/23	Differential Calculus	1.2
M 09/04/23	***No Class: Labor Day***	
W 09/06/23	Integral Calculus	1.3
F 09/08/23	Curvilinear Coordinates	1.4
M 09/11/23	Dirac Delta Function; Theory of Vector Fields	1.5 - 1.6
W 09/13/23	The Electric Field	2.1
F 09/15/23	Divergence and Curl of Elecgtrostatic Fields	2.2
M 09/18/23	Electric Potential I	2.3
W 09/20/23	Electric Potential II	2.3
F 09/22/23	Work and Energy in Electrostatics	2.4
M 09/25/23	Conductors	2.5
W 09/27/23	Capacitors	2.5
F 09/29/23	Laplace's Equation	3.1
M 10/02/23	Method of Images	3.2
W 10/04/23	Separation of Variables 1	3.3
F 10/06/23	Wrap up and Review	
M 10/09/23	**Exam 1**	
W 10/11/23	Separation of Variables 2	3.3
F 10/13/23	Multipole Expansion	3.4
M 10/16/23	Polarization	4.1
W 10/18/23	Field of Polarized Object	4.2
F 10/20/23	***No Class: Fall Break***	
M 10/23/23	The Electric Displacement	4.3
W 10/25/23	Linear Dielectris	4.4
F 10/27/23	The Lorentz Force	5.1
M 10/30/23	Biot-Savart Law	5.2
W 11/01/23	Divergence and Curl of B 1	5.3
F 11/03/23	Divergence and Curl of B 2	5.3
M 11/06/23	Magnetic Vector Potential 1	5.4
W 11/08/23	Magnetic Vector Potential 2	5.4
F 11/10/23	Magnetization	6.1
M 11/13/23	Field of Magnetized Object	6.2
W 11/15/23	H Field	6.3
F 11/17/23	Wrap up and Review	
M 11/20/23	**Exam 2**	
W 11/22/23	**No Class: Thanksgiving**	
F 11/24/23	**No Class: Thanksgiving**	
M 11/27/23	Linear and Nonlinear Media	6.4
W 11/29/23	EMF	7.1
F 12/01/23	Electromagnetic Induction	7.1
M 12/04/23	Maxwell's Equations 1	7.3
W 12/06/23	Maxwell's Equations 2	7.3
F 12/08/23	Wrap Up and Review	
M 12/11/23	**Final Exam (7:30 - 10:00 am)**	
W 12/13/23		
F 12/15/23		