

ELECTROMAGNETISM I -PHY440 Fall 2024

Instructor: Dermot Coffey

Office: SAMC 281 email: coffeyd@buffalostate.edu

Lecture: Monday, Wednesday and Friday 11.00 to 11.50 am in SAMC 169.

Office Hours: TBA

Description of the Course

Electrodynamics is the study of the effects of the electric and magnetic fields which arise from moving charges. In this course we start from stationary charges and determine the resulting electric fields which arise from different charge distributions. Then we move on to time-independent magnetic fields and how they arise from current distributions. Finally we introduce time dependent fields and Maxwell's Equations.

Syllabus:

1. Vector Analysis

Vector Algebra and Calculus

Coordinate Systems

2. Electrostatics

Electric fields and Electric Potential

Laplace's Equation

3. Electric Fields in Matter

Polarization

Electric Displacement

Dielectrics

4. Magnetostatics

The Lorentz Force Law

Biot-Savart Law

Divergence and Curl of \vec{B} and the Magnetic Vector Potential

5. Magnetic Fields in Matter

Magnetization

Magnetic Field of a Magnetized Object

Auxiliary Field \vec{H}

6. Electrodynamics

Electromotive Force

Electromagnetic Induction

Maxwell's Equations

Text: *Introduction to Electrodynamics*, 4th edition,
by D. J. Griffiths published by Prentice-Hall.

Grades:

Grades will be based on homework, numerical assignments, recitations, two in-class closed book exams, and a final exam, which will be off-campus:

homework: 25%

numerical: 10%

exam 1: 20%,

exam 2: 20%

final: 25%.

The course relies heavily on your ability to use calculus and will require you to use the programming skills from PHY310 to complete the homework assignments. Recitation sessions will involve review of material already covered in the lectures.

Attendance Policy:

Attendance at exams is required. Attendance at lectures is not, but is strongly recommended.

Learning Outcomes:

Students will demonstrate:

- an understanding of electrodynamics through the ability to determine the static electric and magnetic fields of systems by solving Maxwell's equations
- and
- ability to apply analytical and computer programming skills to solve differential equations and evaluate integral expressions arising from the application of Maxwell's equations for charge and current distributions.

Title IX

The University does not tolerate any form of discrimination or harassment (including sexual assault, dating and domestic violence, stalking) based on protected characteristics (e.g., sex, gender identity, sexual orientation, religion, pregnancy, etc.) or related retaliation. All faculty and teaching assistants are considered mandated reporters by the University, which means that if they observe or learn of sex-based harassment/ discrimination or related retaliation, they are obligated to immediately share that information with the University's Title IX Coordinator. This obligation, grounded in law and policy, is designed to protect the safety of students and the broader Buffalo State community, as well as ensure that students receive information about available supportive measures and resolution options to enable them to make informed choices. Supportive measures include reasonable academic accommodations available with or without the filing of a formal complaint. If you need academic accommodations due to sex discrimination, harassment, or related retaliation, you may:

On Campus Resources:

- Contact the TIX Coordinator directly (titleix@buffalostate.edu or 716-878-5212), without sharing any personal information with me.
- If you would like to speak with a confidential counselor about sexual misconduct, The Counseling Center provides 24/7 confidential support for students via the Bengal Support Line (833-823-0260), or by scheduling an appointment at 716-878-4436.
- If you are a student with a disability and require reasonable accommodations to meaningfully participate in this course, please contact the University's Student Accessibility Services at your earliest convenience (sas@buffalostate.edu or 716-878-4500), as SAS is responsible for processing and approving such requests.
- If you are pregnant, have recently experienced childbirth, and/or have medical needs related to childbirth, please contact our Title IX Coordinator for assistance.
- You can file an anonymous report with our University Police Department: 716-878-6333, police@buffalostate.edu

Off Campus Resources

- Crisis Services: 24/7 hotline, 716-834-3131
- National Suicide Prevention Lifeline: 1-800-273-8255