KENNESAW STATE UNIVERSITY

SYLLABUS

COLLEGE OF SCIENCE AND MATHEMATICS
DEPARTMENT OF PHYSICS, CSM

PHYS 3220: ELECTROMAGNETISM I
FALL 2024

Course Information

Class meeting time: *MWF 11:15 am - 12:05 pm*
Modality and Location: *Academic Building, Room 250* ***(in-person)***

Instructor Information

Name: Dr. Karunananda Pemasiri
Email: kpemasir@kennesaw.edu
Office Location: Crawford Lab Building - Room E130
Office Phone: 470–578–3431
Office Hours: *MWF @ 10:00 – 11:00 am* and *TR @ 11:00 am – 12:00 pm* or *by appointment*

Preferred method of communication: *email* (Do not email through D2L)

Course Description

Prerequisite: *Grades of "C" or better in MATH 2203, and PHYS 2212/2212L*

This course is a survey of fundamental principles of electricity and magnetism. Students will learn and solve problems in electrostatic fields, magnetic fields of steady currents, and time-dependent electromagnetic fields.

Course Materials

Required Texts: Introduction to Electrodynamics (5th Edition), by David Griffiths; Publisher-Pearson

Recommended Texts:

1. Electromagnetism (1st Edition), by Gerald L. Pollack, Daniel R. Stump; Publisher - Addison-Wesley
2. Classical Electrodynamics (1st Edition), by Walter Greiner; Publisher - Springer
3. Foundations of Electromagnetic Theory (4th Edition), by R. Reitz, F.J. Milford, and R.W. Christy

Learning Outcomes

After completing PHYS 3220, Electromagnetism I students,

1) Understand and apply Gauss's Law and the relationship between the electric field and potential
2) Solve Laplace's equations for applications in electrostatics
3) Understand and apply Ampere's Law and the relationship between the magnetic field and magnetic vector potential in magnetostatics

4) Understand and apply Faraday's law and a unified system of the Maxwell equations

Course Structure

In this class, I will employ an effective and proven teaching methodology known as "Active Learning." Unlike traditional lectures that foster passive learning, I will take on the role of a facilitator while you become an engaged learner. Together, we will work in small groups, collaborating to solve problems and actively participate in the classroom. This approach minimizes lecture time and maximizes active learning experiences. As a result, the following components will be integrated into our class:

1. Pre-Reading Assignments: To prepare for each class, you will be required to read or watch relevant materials before the class.
2. Unannounced Quizzes: Throughout the course, there will be unannounced quizzes during class sessions. These quizzes may cover the readings, as well as the material discussed in the class.
3. Group Problem Solving: This will be a key component, where you will have the opportunity to solve problems in groups with opportunities for presentations on problem-solving tasks. These presentations aim to stimulate discussions and enhance your problem-solving skills. Evaluation of your group's performance and problem-solving presentations will factor into your overall grade.
4. In-Class Discussions: Our class will foster active and dynamic discussions. This will create an environment where you can delve deeper into the subject matter, exchange ideas, and explore diverse perspectives. Participation in these discussions will enhance your understanding and encourage critical analysis.
5. Project: You will be working on a project aligned with the course concepts. The assignment of the class project will take place following the first midterm, and you will collaborate with a partner on this project.

By implementing these components, our aim is to create an engaging and interactive learning environment. This pedagogical approach facilitates a deeper comprehension of the material, enhances critical thinking abilities, and promotes collaboration among students.

Course Requirements and Assignments

Homework:
You will be given homework throughout the semester and will be posted through D2L. Your work must be handed in at the start of class on or before the due date, or in person by the due date. Also, make sure to submit a well scanned pdf version of your work to D2L for records. If you fail to turn your work in on time, you have until the end of the week (Friday 5 pm) to turn your work in with a penalty of 20% deduction. Any homework after the end of the week it's due will NOT be accepted as the answers will be posted in D2L by then. I strongly recommend forming study groups for solving the homework. You may discuss the homework problems with each other, and I encourage discussions among students, but you should not copy solutions from another. The solutions that you submit must be entirely yours and in your own words with detailed explanations. If you use the internet as a guide, please site those websites. Any copied or plagiarized work will receive a zero.

Exams: You will be given two unit exams and a comprehensive final exam. You are allowed to bring one page of the equation sheet for the unit exams, and for the final exam. There will be no make-up exams for unit exams unless it is due to unforeseen and valid reasons.

Unit Exam 1 – *September 30th, 2024*
Unit Exam 2 – *November 04th, 2024*

Final Exam - *December 04th, 2024 @ 10:30 – 12:30 pm*

Do not make any plans that might conflict with the final exam. The mandatory final exam **will not** be individually rescheduled to accommodate any other plans.

Important Dates:
Last day to drop/Add: *11:45 pm on August 16th, 2024*
Last day to withdraw without Academic Penalty: *11:45 pm on October 25th, 2024*

Evaluation and Grading Policies

Component	Weight	Note
Homework Assignments	25%	(lowest will be dropped)
Group Problems	10%	(lowest will be dropped)
Quizzes	5%	(lowest will be dropped)
Unit Exams	20%	
Project	10%	
Final Exam	30%	

GRADING SCALE:

90%	-	100%	A
80%	-	89%	B
70%	-	79%	C
60%	-	69%	D
0%	-	59%	F

I will round up grades if they are ≤ 0.9; for example, 89.1 is an A, but 89.0 is a B.

Course Policies

Attendance Policy: Your active, engaged participation in activities in each class period contributes to the learning experience. To ensure that you learn well and perform well in in-class assessments such as quizzes, please arrive on time and prepared, remaining until class is over.

Email Policy: If you have questions or concerns about our course, please send your messages to kpemasir@kennesaw.edu. I will do my best to respond within 24 hours Monday-Friday. While I will also respond to messages sent through the D2L email client, it may take longer for me to respond. If you prefer to communicate in person, you may visit me during our regularly scheduled office hours.

Homework Policy: You MUST turn in your homework in hand for grading. You must also submit it online (in the D2L folder assigned to the assignment) for electronic record. It is required that you submit a single pdf file. Scan the pages and submit them as a single PDF file (Do not take photographs and upload individual pages). Many iPhone and Android phone apps are available for scanning pages and converting them to PDF files, including CamScanner, Genius Scan, Adobe Scan, etc. You need to turn Homework in on a given due date and time. You may submit late homework up to five days from the due date for 80% credits. After five days, homework solutions will be uploaded to D2L, and therefore, late submissions will not be accepted beyond that point.

Exams Policy: Please remember, using signal-emitting mobile devices in exams is not allowed. All phones must be turned off. Makeup exams for unit tests are only possible due to unforeseen and valid reasons. Decisions on makeup exams rest with the instructor and department chair, based on evidence and excused emergencies.

AI Use Prohibited:

You are expected to generate your own work in this course. When you submit any kind of work, you are asserting that you have created it completely on your own unless you indicate otherwise using quotation marks and proper citation for the source(s) you used to help you. Submitting content that has been generated by someone other than you, or that was created or assisted by an AI generative tool is cheating and constitutes a violation of the KSU Code of Academic Integrity.

Institutional Policies & KSU Student Resources

This link contains information on Institutional Policies and help and resources available to students: KSU Student Syllabus Resources

CARE SERVICES
Any student experiencing financial hardship and believes this may affect their academic success is urged to complete an Emergency Assistance Application with CARE Services. The Emergency Assistance Program supports students in overcoming unforeseen hardships hindering their academic progress. For help, go to Emergency Assistance or email emergencyassistance@kennesaw.edu.

Course Schedule

Week	Date	**Tentative Topics** (subject to minor changes*)
1	Day 1 – 12th Aug 2024	Introduction to the course & Review of Vector Calculus (CH 1)
	Day 2 – 14th Aug 2024	
	Day 3 – 16th Aug 2024	
2	Day 1 – 19th Aug 2024	Electric Fields (CH 2.1)
	Day 2 – 21st Aug 2024	Gauss's law and Divergence & Curl of Electrostatic Fields (CH 2.2)
	Day 3 – 23rd Aug 2024	Problem Solving: Application of Gauss's law
3	Day 1 – 26th Aug 2024	Electric Potential (CH 2.3)
	Day 2 – 28th Aug 2024	Electric Potentials of Localized Charge Distributions (CH 2.3)
	Day 3 – 30th Aug 2024	Problem Solving: Electric Potentials
4	Day 1 – 02nd Sep 2024	**Holiday - Labor Day 2024**
	Day 2 – 04th Sep 2024	Work & Energy in Electrostatics (CH 2.4)
	Day 3 – 06th Sep 2024	Conductors in Electrostatic Equilibrium (CH 2.5)
5	Day 1 – 09th Sep 2024	Boundary Conditions (CH2.3) & Laplace's Equation (CH 3.1)
	Day 2 – 11th Sep 2024	Method of Images (CH 3.2)
	Day 3 – 13th Sep 2024	Problem Solving: Method of Images
6	Day 1 – 16th Sep 2024	The Method of Separation of Variables (CH 3.3)
	Day 2 – 18th Sep 2024	Separation of Variables in Spherical Coordinates (CH 3.3)
	Day 3 – 20th Sep 2024	Problem Solving: Method of Separation of Variables
7	Day 1 – 23rd Sep 2024	Multipole Expansion (CH 3.4)
	Day 2 – 25th Sep 2024	Applications of Multipole Expansion (CH 3.4)
	Day 3 – 27th Sep 2024	Problem Solving: Multipole Expansion

8	Day 1 – 30th Sep 2024	**Unit Exam 1** (on topics covered in chapters 02 & 03)
	Day 2 – 02nd Oct 2024	The Lorentz Force Law (CH 5.1)
	Day 3 – 04th Oct 2024	Current Densities & Continuity Equation (CH 5.1)
9	Day 1 – 07th Oct 2024	The Biot-Savart Law (CH 5.2)
	Day 2 – 09th Oct 2024	Applications of the Biot-Savart Law (CH 5.2)
	Day 3 – 11th Oct 2024	Problem Solving: Biot-Savart Law
10	Day 1 – 14th Oct 2024	The Divergence & Curl of $\vec{B}$ & The Ampere's Law (CH 5.3)
	Day 2 – 16th Oct 2024	Magnetic Vector Potential & Boundary Conditions (CH 5.4)
	Day 3 – 18th Oct 2024	Problem Solving: Ampere's Law
11	Day 1 – 21st Oct 2024	Multipole Expansion of the Vector Potential and Magnetic Moments (CH 5.4)
	Day 2 – 23rd Oct 2024	Magnetization & The Field of a Magnetized Object (CH 6.1 - 6.3)
	Day 3 – 25th Oct 2024	Problem Solving: Vector Potential
12	Day 1 – 28th Oct 2024	Linear & Nonlinear Media (CH 6.4)
	Day 2 – 30th Oct 2024	Electromotive Force & Motional emf (CH 7.1)
	Day 3 – 01st Nov 2024	Problem Solving: Ampere's Law in Magnetized Materials
13	Day 1 – 04th Nov 2024	**Unit Exam 2** (on topics covered in chapters 05 & 06)
	Day 2 – 06th Nov 2024	Electromagnetic Induction: Faraday's Law (CH 7.2)
	Day 3 – 08th Nov 2024	Maxwell's Equations (CH 7.3)
14	Day 1 – 11th Nov 2024	Maxwell's Equations in Matter (CH 7.3)
	Day 2 – 13th Nov 2024	Charge & Energy Conservation (CH 8.1)
	Day 3 – 15th Nov 2024	Problem Solving: Maxwell's Equation
15	Day 1 – 18th Nov 2024	Electromagnetic Waves in Vacuum (CH 9.2)
	Day 2 – 20th Nov 2024	**Student project presentations**
	Day 3 – 22nd Nov 2024	Review
25th Nov 2024 – 01st Dec 2024		**Fall Break (No classes)**
December 04th, 2024 10:30 – 12:30 pm		**Final Exam**

*Please be aware that the syllabus may undergo slight modifications based on how it progresses in alignment with students' learning experiences. However, there will be no changes to the examination dates.