ANDERSON UNIVERSITY

General Physics II (calculus based)

PHYS 2250

Instructor Info

Name: Tyler Williamson

Office Hours: M T W: 3-5pm, W F: 12-1 pm

Office: Hartung 315A

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Course Info

Prereq: PHYS 2240, MATH 2020

Meeting Days: M W F

Meeting Times: 11am-11:50am

Location: Hartung 318

Lab Info

Meeting Days: Thursday

Meeting Times: LA: 9am-10:50am
LB: 3pm-4:50pm

Location: Hartung 319

Overview

This course will provide a thorough introduction to electromagnetic interactions. Electric charges and the forces they produce will be discussed, along with electronic currents and their corresponding magnetic forces. The manifestation of these phenomena in the form of electric circuits will be discussed and analyzed.

Note: This is an entirely in-person course, although material will be replicated online to accommodate ill or quarantined students.

Material

Required Texts

Chabay, R.W. and Sherwood, B.A. *Matter and Interactions*. 4th Edition. Wiley. 2014.

Grading Scheme

Homework	30%
Quizzes	20%
Labs	15%
Exams ($2 \times 10\%$)	20%
Final Exam	15%

$grade \geq 93$	A	$73 \leq grade < 77$	C
$90 \leq grade < 93$	A-	$70 \leq grade < 73$	C-
$87 \leq grade < 90$	B+	$67 \leq grade < 70$	D+
$83 \leq grade < 87$	B	$63 \leq grade < 67$	D
$80 \leq grade < 83$	B-	$60 \leq grade < 63$	D-
$77 \leq grade < 80$	C+	$grade < 60$	F

Note: As the instructor, I reserve the right to change the grade of any student, but only to that student's benefit and only under exceptional circumstances.

Learning Objectives

- Learn to calculate electric fields, potentials, and forces associated with common charge distributions
- Learn to calculate magnetic fields and forces from common current configurations
- Learn to analyze circuits on both a microscopic and macroscopic scale
- Be introduced to electrodynamics: the connection between electricity and magnetism
- Be introduced to electromagnetic radiation and its basic properties
- Learn how to approach complex problems like a physicist

Course Requirements

Homework

Homework problems, designed to give you practice with the material being taugh in class, will be assigned on a regular basis.

Quizzes

Quizzes will be administered frequently. Quizzes will usually resemble the homework and should be easy if the homework has been thoroughly completed.

Labs

Labs provide a hands-on perspective to the physical phenomena being discussed in class. Lab grades will be decided on the basis of a lab report. Expectations for lab reports will be discussed in class.

Exams

Exams will be administered in class and are designed to assess your understanding of the material.

COVID-19 Statement

As a member of the AU community, we acknowledge our covenant to protect and care for each other by embracing the following measures in this class: wearing a facial covering, maintaining 6' physical distance from others, practicing good respiratory hygiene, and using hand hygiene.

Due to the unpredictable nature of the COVID-19 pandemic, and factors that are out of control of the instructor, students should be prepared for a (possibly abrupt) pivot in instruction mode. In that situation, learning objectives for the course will remain the same, however the instructor reserves the right to modify due dates as well as the number and frequency of assignments, quizzes, and exams. Any such changes will be communicated via AU email and Canvas.

During this coronavirus pandemic, the AU faculty and staff are making every effort to provide the best possible environment for face-to-face (F2F) instruction, as well as the best online environment, if we are forced to transition online. We encourage you to follow the community covenant, both on campus and off campus, in your educational environments as well as in your social environments. These guidelines are intended to maximize the amount of F2F instruction, by reducing the transmission rate of the coronavirus on campus and in the surrounding community. **As such, all Physical Sciences and Engineering department classes taught in face-to-face format will require properly worn facial coverings, 6' physical distancing, and good respiratory and hand hygiene**. Note that accommodations will be made for cases approved by the University for those students who cannot wear a facial covering for health reasons.

The department faculty will facilitate learning in this pandemic environment through the use of tools such as email, Canvas (learning management system), Kaltura (recording F2F lectures and labs), and/or other educational tools. These tools allow for flexible learning, in the cases where students are unable to attend class in person, either through illness, quarantine, the need to care for family members, or other situations.

Traditional F2F lab activities have included close collaboration between professor and student, and we will need to balance those learning opportunities with the need for physical distancing. Students will work individually, rather than in lab groups, and strict physical distancing will be enforced to the degree possible. Some laboratory experiences will utilize online tools to facilitate appropriate distancing.

It is imperative that we work together to slow the spread, through the community care covenant. It is very important that we communicate clearly with each other, extending grace towards each other, and solving problems together. Please contact your professor and/or the chair of the Physical Sciences and Engineering department, Dr. Benjamin McPheron, with any concerns, and keep us up to date regarding any changes in your class attendance.

Attendance Policy

Class attendance is fundamental to the teaching/learning process and any absence from a class results in a loss of learning for the student and learning community. In the current pandemic environment, it is imperative that we balance our face-to-face learning with the risk posed by the coronavirus. For this reason, if you need to miss class for any reason (such as feeling a little under the weather), participation in the equivalent online activities will not count as an absence presuming, if applicable, any required assignments are completed. It is the student's obligation to personally notify the course instructor when not attending the class face-to-face, in advance if possible, and to complete the required assignments for that class session prior to the due date, or at a modified date at the discretion of the instructor. In the case of an extended illness or a mandated quarantine, notify the professor as soon as possible to discuss options for modified due dates or other accommodations.

Academic Integrity

As an institution of higher education committed to academic and Christian discovery, Anderson University expects faculty and students alike to maintain the highest standards of academic and personal integrity. “Anderson University seeks to support and promote qualities of academic honesty and personal integrity and regards cheating, plagiarism, and all other forms of academic dishonesty as serious offenses against the University community” (Faculty Handbook 4.23 Policy on Academic Integrity). See the student handbook for examples of plagiarism. When an instructor has additional definitions of academic dishonesty, they must be stated in the Syllabus at the beginning of the course.

You are expected to do your own work in this course. While collaboration with others on homework assignments is allowed, the work you turn in must be substantially your own. Be mindful that you personally are responsible for understanding the material during a quiz or exam. Any incidences of academic dishonesty will be handled according to University policy.

Academic Support

Accessibility and Accommodations

Important: If you have any special accessibility needs (i.e. use of screen reading software, captioning, etc.), please notify your professor and the Director of Disability Services for Students (Kissinger Academic Center for Excellence, Nicholson Library; 765-641-4223) as soon as possible. If you anticipate or experience physical or academic barriers based on disability, you are encouraged to contact the Director of Disability Services for Students (Kissinger Academic Center for Excellence, Nicholson Library; 765-641-4223). To receive reasonable accommodations, you must contact Disability Services for Students, provide documentation, and request accommodations. You should also notify your course instructor during the first week of classes.

Kissinger Academic Center for Excellence

The Kissinger Academic Center for Excellence (KACE), located on the ground floor of the Nicholson Library, provides excellent resources in all areas of study regardless of academic ability. Many students can benefit from academic support and/or sharpen their skills through studying with others. In addition, excellent students often maintain their skills by working as peer tutors. The services are available for all enrolled students at no charge. For information, call 765-641-4225.

Pathways Program

Anderson University has a robust referral system that was created to connect students with the campus resources that will be most beneficial to them. Students may be referred by faculty for any student success issue. Students will be contacted by an appropriate staff or faculty member to provide support and care. For more information please see: anderson.pharos360.com.

Diversity and Inclusivity Statement

I consider this classroom to be a place where you will be treated with respect, and I welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, ability - and other visible and non-visible differences. All members of this class are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the class.

Class Schedule

Subject to change

Week 1	Intro to electromagnetic interactions, review of vectors and calculus	Chabay & Sherwood, 13.1
	Electric force, fields, & superposition	Chabay & Sherwood 13.2-13.5
	Dipoles	Chabay & Sherwood, 13.6-13.7
Week 2	Charged matter & Polarization	Chabay & Sherwood, 14.1-14.3
	Insulators & Conductors	Chabay & Sherwood, 14.4-14.5
	Charge transfer and motion in metals	Chabay & Sherwood, 14.6-14.7
Week 3	Uniformly charged rod; calculating field of distributed charge	Chabay & Sherwood, 15.1-15.2
	Field of a ring; disk; capacitor	Chabay & Sherwood 15.3-15.5
	Field of hollow and solid spheres	Chabay & Sherwood, 15.6-15.7
Week 4	Potential energy & electric potential	Chabay & Sherwood, 16.1-16.3
	Potential difference in a varying field; path independence	Chabay & Sherwood, 16.4-16.6
	Potential at one location; potential in an insulator; energy density in the electric field	Chabay & Sherwood, 16.7-16.10
Week 5	Exam 1 (chapters 13-16)	
	Electric current; Biot-Savart law	Chabay & Sherwood, 17.1-17.3
	Conventional current; Magnetic field of current distributions	Chabay & Sherwood, 17.5-17.7
Week 6	Field of a circular loop; Magnetic dipoles	Chabay & Sherwood, 17.8, 17.10
	Field of a bar magnet; atomic structure of magnets	Chabay & Sherwood, 17.11-17.12
	Fall Break	
Week 7	Current within circuits	Chabay & Sherwood, 18.1-18.3
	Charge and field in circuits; Surface charge distributions; The initial transient	Chabay & Sherwood, 18.4-18.6
	Feedback, surface charge and resistors, energy conservation	Chabay & Sherwood, 18.7-18.9
Week 8	Capacitors in circuits	Chabay & Sherwood, 19.1
	Resistors in circuits	Chabay & Sherwood, 19.2-19.3
	Work, power, & batteries	Chabay & Sherwood, 19.4-19.5
Week 9	Ammeters, voltmeters, & quantitative circuit analysis	Chabay & Sherwood, 19.6-19.7

	Magnetic force on particles and currents	Chabay & Sherwood, 20.1-20.2
	Magnetic & Electric forces: The Hall Effect	Chabay & Sherwood, 20.3-20.4
Week 10	Motional emf	Chabay & Sherwood, 20.5
	Magnetic torque and potential energy; motors and generators	Chabay & Sherwood, 20.7-20.8
	Electric flux & Gauss's Law	Chabay & Sherwood, 21.1-21.3
Week 11	Exam 2 (chapters 17-20)	
	Reasoning from Gauss's Law	Chabay & Sherwood, 21.4
	Ampere's Law & Maxwell's Equations	Chabay & Sherwood, 21.6
	Faraday's Law	Chabay & Sherwood, 22.1-22.2
Week 12	Faraday's Law & Motional emf; Inductance	Chabay & Sherwood, 22.3-22.4,22.6
	Fields traveling through space*	Chabay & Sherwood, 23.1-23.2
	Radiation from accelerated charges; sinusoidal radiation*	Chabay & Sherwood, 23.3-23.4
Week 13	Thanksgiving Break	
Week 14	Energy and momentum in electromagnetic radiation; Effects of radiation on matter*	Chabay & Sherwood, 23.5-23.6
	Light propagation through a medium*	Chabay & Sherwood, 23.7
	Refraction, lenses, & images*	Chabay & Sherwood, 23.8-23.10
Week 15	Optics, review*	

* *Time permitting*

Lab Schedule

Subject to change

Lab 1	Charge counting
Lab 2	Electric Field mapping
Lab 3	Magnetic field
Lab 4	Bar magnets & ferrormagnets
Lab 5	Circuits I
Lab 6	Circuits II
Lab 7	Circuits III
Lab 8	Current force
Lab 9	Induced current
Lab 10	Electromagnets
Lab 11	Optics I*
Lab 12	Optics II*
Lab 13	Optics III*

**Time permitting*