## ****Electricity and Magnetism I**** (PHY 430)

## Fall 2022

**Course Description:** Electrostatics of point charges and extended charge distributions, fields in dielectrics, and magnetic fields due to steady currents. Ampere's Law and induced emfs. Topics in electromagnetic waves as time permits. *It is worth noting that this course is also the venue for introducing classical field theories. Other classical field theories applying similar techniques include fluid mechanics and the continum mechanics of solids.*

**Prerequisites**: PHY 430 requires prerequisites of PHY 300 and MAT 343 or PHY 370.

## Instructor Information:

Dr. Shawn H. Pfeil (*last name pronounced “file”*)

Research Interests: Molecular Biophysics

e-mail: spfeil@wcupa.edu (please identify which course you are contacting me about)

phone: (610) 430-4084

office: SECC 363

## Course Meeting Time and Place:

This course meets twice a week.

|  |  |
| --- | --- |
| Meeting Time | Location |
| TuTh 9:30AM - 10:45AM | SECC 106 |

## Office Hours:

My published office hours are listed in the table below.

|  |  |  |  |
| --- | --- | --- | --- |
| Monday | Tuesday | Thursday | Friday |
|  9-10 AM | 8:15-9:15 AM | 8:15-9:15 AM | 8:15-10:15 AM |

***Office hours are available by appointment for students with an ongoing conflict with my scheduled hours.***

## Required Course Materials

***Textbook:*** Introduction to Electrodynamics 4th ed., David J. Griffiths (ISBN-10, 0-321-85656-2).

***Computational:*** We will be integrating some computational tasks into our homework assignments. I suggest using Matlab, which was introduced in PHY 175, and for which WCU has a site license. (You don’t need to buy this.) You can find information at <https://www.mathworks.com/academia/tah-portal/west-chester-university-of-pennsylvania-40730091.html> Solutions to computational problems will be presented in the Matlab programing language.

## Course Elements:

* **Pre-Class Reading:** You must read the assigned reading prior to class. Due to the pace of the course, we must focus our time in lecture on more challenging concepts. You are responsible for coming prepared.
* **Lecture:** Lots of questions are encouraged. This will be as informal as possible.
* **Problem Sets (Written):** A problem set will be posted on D2L for each class meeting. Problem sets from the previous week are due Tuesday at the start of class. The Matlab portion of the homework is due as a D2L assignment by the same time.

## Grading:

|  |  |
| --- | --- |
| **Component** | **Percentage** |
| Regular Exams | 60% (three equally weighted exams.) |
| Final Exam | 25% |
| Problem Sets (written and electronic) | 15% |

* **Regular Exams**: Three exams spaced through-out the semester. No exam scores will be dropped.
* **Final Exam**: The final exam is cumulative.

**We will be using the official WCU scale for grades, see p.48 in the undergraduate catalog.** However, I reserve the right to adjust the weights of individual components, or the scale to account for unforeseen circumstances.

## Policies Specific to This Course:

**Homework Attribution Policy:** Working together on homework is highly recommended. However, whatever you turn in must represent your understanding. When you work on a problem with another student you must give them attribution. For example, “I worked on this problem with Nicole M.”

**Image Accreditation:** With the advent of homework done on tablets copying and pasting diagrams from the textbook into homework has become more common. If you decide to do this, then you must remember that any image you did not create yourself must have a reference. (The WCU library has wonderful resources on copyright and fair use <https://library.wcupa.edu/facultyresources/copyright>. This stuff matters in STEM as well as the humanities!)

**Classroom Electronics Policy:** Any electronics which keep you from being mentally present in class must be put away. This includes cell phones. Use of electronics in an appropriate manner, for example using a tablet to take notes, is perfectly ok.

## Intellectual Property Statement: I, the instructor, utilize copyrighted materials under the “Freedom and Innovation Revitalizing the United States Entrepreneurship Act of 2007” (Fair Use Act). Apart from such copyrighted materials, all other intellectual property associated with this course is owned and copyrighted by the instructor, including, but not limited to, lectures, course discussions, course notes, slides, assessment instruments such as exams, and supplementary materials posted or provided to students authored by the instructor. No recording, copying, storage in a retrieval system, or dissemination in any form by any means of the intellectual property of the instructor, in whole or in part, is permitted without prior written permission of the instructor. When such permission is granted, it must specify the utilization of the intellectual property and all such permissions and waivers shall terminate on the last day of finals of the semester in which this course is held.

**Academic Integrity Addendum:** Please see the WCU common policies regarding academic misconduct. I have no patience for any kind of academic misconduct from majors in the Department. Physicists are professionals, and any-kind of academic misconduct is strictly against our professional code. This includes but is not limited to, copying homework solutions from any source. It may not seem as bad, but sharing your work with others, who are going to use it to be dishonest is also not allowed by our code of conduct. For this reason, uploading material to “tutoring” websites such as Chegg and Course Hero, are also not permissible. Please note that this usually also constitutes theft of intellectual property.

## Makeup Exam Policy: Reasons for missing an exam fall under three broad headings: (1) University Sanctioned Events (please see the common policy statement.) These events always have prior notice. I will give you a makeup exam if you give me prior notice. (2) Medical Issues. These come in two flavors (a) scheduled events, such as having your wisdom teeth removed, and (b) unscheduled events such as testing positive for COVID. For scheduled you must give prior notice. For unscheduled events, please let me know as soon as is reasonable. I don’t expect you to e-mail me on the way to the hospital, but I do expect to be contact me once things are stable and you are able. Medical events will be excused if proper notice is given. (3) Other Issues. If you have a conflict with an exam and know in advance, ask me about it. If it is truly unavoidable, reasonable, and you don’t have scheduling control, for example National Guard exercises etc., I’ll excuse it. If you don’t know in advance but it is unavoidable, for example your car breaks down on the highway on the way to the exam, let me know as soon as possible.

## *In all cases, I reserve the right to weight your final exam more heavily instead of giving a makeup exam.* This is a last resort, but your need for a makeup exam must be balanced against your peer’s need for timely feedback.

**Attendance Policy:** This course is not graded on attendance. However, I do keep track of it.

**University Wide Policies:**

Can be found here: <https://www.wcupa.edu/viceProvost/documents/CommonSyllabusStatements_UGRD-2215.docx>

## Course Schedule: Tentative schedule (subject to change).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Date** | **Day** | **#** | **Topic** | **Reading** | **Homework** |
| 08/30 | T | 1 | Vector Analysis | 1.1/1.2 |  |
| 09/01 | R | 2 | Vector Analysis | 1.2/1.3 |  |
| 09/06 | T | 4 | Vector Analysis | 1.4/1.5 | HW 1 Due |
| 09/08 | R | 5 | Vector Analysis/Electrostatics | 1.6/2.1 |  |
| 09/13 | T | 7 | Electrostatics | 2.2 | HW 2 Due |
| 09/15 | R | 9 | Electrostatics | 2.2/2.3 |  |
| 09/20 | T | 10 | Electrostatics | 2.4/2.5 | HW 3 Due |
| 09/22 | R | 11 | Electrostatics/Special Techniques | 2.5/3.1 |  |
| 09/27 | T | 13 | Special Techniques | 3.2/3.3 | HW 4 Due |
| 09/29 | R |  | **Exam 1: Chapter 1 & 2** |  |  |
| 10/04 | T | 15 | Special Techniques | 3.3/3.4 | HW 5 Due |
| 10/06 | R | 16 | Special Techniques | 3.4 |  |
| 10/11 | T | 18 | Electric Fields in Matter | 4.1/4.2 | HW 6 Due |
| 10/13 | R | 19 | Electric Fields in Matter | 4.2/4.3 |  |
| 10/18 | T |  | **Fall Break** |  |  |
| 10/20 | R |  | Electric Fields in Matter/Magnetostatics | 4.4/5.1 |  |
| 10/25 | T | 21 | Magnetostatics | 5.1/5.2 | HW 7 Due |
| 10/27 | R | 22 | **Exam 2: Chapter 3 & 4** |  |  |
| 11/01 | T | 24 | Magnetostatics | 5.2/5.3 | HW 8 Due |
| 11/03 | R |  | Magnetostatics | 5.3/5.4 |  |
| 11/08 | T | 26 | Magnetostatics | 5.4 | HW 9 Due |
| 11/10 | R | 27 | Magnetic Fields in Matter | 6.1/6.2 |  |
| 11/15 | T | 29 | Magnetic Fields in Matter | 6.2/6.3 | HW 10 Due |
| 11/17 | R | 30 | Magnetic Fields in Matter/ EMF | 6.4/7.1 |  |
| 11/22 | T | 32 | Electromagnetic Induction | 7.2 | HW 11 Due |
| 11/24 | R | 34 | **Thanksgiving Break** |  |  |
| 11/29 | T | 35 | Electromagnetic Induction | 7.2 | HW 12 Due |
| 12/01 | R |  | **Exam 3: Chapter 5 & 6** |  |  |
| 12/06 | T | 37 | Maxwell’s Equations | 7.3 | HW 13 Due |
| 12/08 | R |  | Maxwell’s Equations |  |  |

**Final Exam 8-10 AM, Thursday, 12/15/2022, in our normal room.**