PHYS 2426.001
University Physics II: Electricity and Magnetism
COURSE SYLLABUS: FALL 2017

WE WERE GOING TO USE THE TIME MACHINE TO PREVENT THE ROBOT APOCALYPSE, BUT THE GUY WHO BUILT IT WAS AN ELECTRICAL ENGINEER.

(xkcd.com/567/)

Instructor: Dr. Matt Wood (matt.wood@tamuc.edu)
Office Location: STC 106
Class time: MWF 11:00 – 12:50, STC 146
Office Hours: M-F 2-3pm, or by appointment (but drop-by is usually OK*)
* but not within 30 minutes of class start, please!
Office Phone: 903-886-5487
University Email Address: matt.wood@tamuc.edu
Preferred Forms of Communication: Office visit, email
Email Response Time: 24 hours or less
Graduate teaching assistant: John Wallgren; jwallgren@leomail.tamuc.edu
Learning Assistant: Trent Sahinkaya; tsahinkaya@leomail.tamuc.edu

Syllabus/schedule subject to change

COURSE INFORMATION

Textbook(s) Required:

Access to *MasteringPhysics* online homework system, with *Knight, Physics for Scientists and Engineers, 3rd edition*. You have the option of buying *MasteringPhysics* with etext only (ISBN 9780321753052) or *MasteringPhysics* with etext and traditional textbook (ISBN 9780321844354).

McDermott, Tutorials in Introductory Physics Workbook and Homework package (ISBN 9780130970695). This comprises 2 books – one containing class activities, and one containing homework activities.

PHYS 2426 Lab Manual, available at the campus bookstore

Course Description:

Physics 2426 is the second semester of a calculus-based physics sequence. University Physics II introduces electrical and magnetic phenomena in nature, including the concepts of electrical charges, electric and magnetic fields, the application of Gauss' Law, electric potential, conductors and insulators, currents, basic circuits, and induction.

University Catalogue Description

Second semester of calculus based physics with topics in electricity and magnetism for science, mathematics, and engineering students. Prerequisites: PHYS 2425 with a minimum grade of C, MATH 2413. Additionally, MATH 192 or concurrent enrollment.

Student Learning Outcomes

Students will be able to demonstrate the following skills when analyzing situations involving electrostatic fields and potentials and their sources, currents, voltage, capacitance, power, basic electrical circuits, magnetic fields and their sources, and induction:

1. Students will be able to conduct qualitative analysis of electromagnetism problems which demonstrates conceptual understanding as measured by performance in visualizing problems through diagrams, estimating answers, assessing and justifying answers, analyzing graphs and clear, written explanations..
2. Students will be able to perform quantitative calculations in situations involving electric and magnetic fields, and demonstrate knowledge of the relevant basic units, vector addition, and application of basic

calculus. Students will be able to assess answers to questions for plausibility.
3. Students will be able to use simple laboratory demonstrations and computer simulations to explain the basic properties of electric and magnetic fields, and electrical circuits.

COURSE REQUIREMENTS/INFORMATION

Instructional Methods

This class is being taught in studio mode. Studio mode is a student-centered active learning environment that concentrates on group work. A good analogy is with a sports coach: you can't learn a sport from sitting in lecture – only by practicing it yourself with a coach present to give you instruction and feedback. Physics is no different – you can only learn by doing. The majority of class time will be focused on group activities. Activities will include conceptual work, labs, and problem solving. Activities will be completed in groups of 3-4. The instructor will assign groups. Groups will be changed 2-3 times during the semester. The instructor, learning assistant and graduate assistant will go from table to table, frequently sitting and observing your discussion. Our role is to help you ask the right questions that lead to you solving the problems yourselves.

Physics education research has shown that students learn best when actively engaged in class. Studio mode has been implemented at many universities and has been found to have positive impacts on conceptual understanding and problem-solving ability.

Course Design and Critical Thinking (Problem Solving) Skills

I'll just take a moment to explain the reason why we teach the class in so-called studio mode. Many students who take this course will not pursue advanced physics degrees (although some will) and many of you will not often directly use most of the physics concepts taught in the course in your careers. But what you *will* use is your ability to be able to analyze a problem using multiple methods – qualitatlively, conceptually, quantitatively - to simplify it to its fundamental essence to solve it, then systematically add more complexities until you've solved your original problem. No matter what your eventual career, this is what you will be doing, and is what employers are looking for. Employers consistently rank critical thinking and problem-solving ability near the top of their list of desired traits in valued employees. We have redesigned the course to focus on these universal skills; as a bonus, research has shown that focussing on such skills leads to greater

conceptual understanding in physics! In Bloom's taxonomy of cognitive skills, this class focusses the 3 higher-level thinking skills highlighted below.

Bloom's Taxonomy of the Cognitive Domain:

1. **Knowledge** - memorization of facts, words, and symbols
2. **Comprehension** - understanding the meaning of knowledge
3. **Application** - applying concepts to various situations
4. **Analysing**- breaking apart complex ideas in to parts, determining how parts relate to each other and to an overall structure
5. **Evaluating**- making judgements based on criteria and standards through checking and critiquing
6. **Creating**- putting individual ideas together to form a complete explanation; creating a new pattern or approach

Memorization of equations and rote problem solving will not get you very far in this class. In tutorials, group problems, and on a lot of test questions, only about 50% of the points on offer go for picking the right equation, plugging in numbers and getting the right answer. You will have to demonstrate understanding: explain what answer you expect before solving the problem, drawing clear and fully labeled diagrams, explaining things using graphs, and justifying your answers. These are skills we will practice all the time in class, and you will be required to use them on tests. The class period is the time when you should be using the LA, GA and myself to acquire these skills.

And that is what this class is about: acquiring skills. And just like in sports, for example, you can't learn skills by someone getting up and lecturing to you. You only acquire skills by practicing them time and again under the guidance of a coach. In this class, you will practice by working on problems – many of them – and the LA, GA and myself are your coaches.

Class sequence:

The subject matter is divided up into a sequence of 10 topics, each addressed by 1 chapter in the textbook *Physics for Scientists and Engineers*. We will spend about 4 class periods on each topic.

You will need to read the chapter before we cover the material in class. To encourage you to do this, you will be required to complete online reading quizzes by 11.59pm the night before we begin to cover the material in class. I will announce in class when each new reading quiz is available, and when it is due; the first two are on the course schedule at the end of this syllabus. These quizzes count towards your final grade.

Out of the 4 classes we spend on each chapter, approximately two classes will be spent on mini-lectures and group problem solving, one class on a tutorial from the "*Tutorials in Introductory Physics*" workbook, and one on a lab/PhET simulation/real-world problem(s). Every couple of classes you maybe asked to reflect, as a group, on what you have learned from a particular chapter or in a tutorial, and share with the rest of the class. This will be used to guide discussion and mini-lectures. You will also be able to share problem areas and homework problems you are having problems with, and we can discuss them.

A note on reading the textbook: Many students take the wrong approach to reading textbooks; they try and read and understand every word, refuse to move on until they've understood everything in the present section, refuse to skip passages, and only read the material once. Reading textbooks is a skill: here is one of several good websites with instruction on how to acquire that skill.

http://www.dartmouth.edu/~acskills/success/reading.html

When reading textbooks, the aim is not to understand everything right away. You will likely need to read the chapters several times before and after covering the material in class to really feel like you're getting the material (I always had to read textbooks half a dozen times for the content to begin to sink in). The first time you read the chapter, you should skim it (this is the "preview" read discussed in the above website). Let the reading quiz guide you and try and pick up what are the major concepts, equations, and laws you are required to understand to answer problems. After we cover a chapter in class, you can re-read the chapter and pick up on the things you missed/didn't understand the first time through. Bear in mind that the textbook now fills the role of much of the traditional lecture.

A note on "physics is hard": Yes, it is. It is for everyone, and it was for me (it was for Einstein, too). Some of you come from high school with great physics teachers and a lot of funding – you've had AP physics and calculus and are very well prepared. Many of you don't have this background at all. You may be in a group with someone that does, and they're "getting it" quickly while you're still struggling. This doesn't mean that the other person is innately talented and you are not – in most cases it just means that they have spent more time doing math and physics in the past than you have. You can do it – you just need to put in the time. This "genius" narrative – mistaking background for ability – can particularly negatively affect women and underrepresented minorities due to existing stereotypes about these groups. In studio physics, we are hoping you will feel proud

about yourself and your accomplishments. You can feel ownership for your contributions to your group; proud of your improvement; proud of challenging yourself; proud of your ability to discuss physics concepts with others, and more. Want to read more about this? Follow this link: http://www.aas.org/cswa/status/status_2015jun.pdf and read the essay on page 7 by Dr. Angela Little.

Finding Help

The **class period** is intended to be the time when you acquire *understanding*. The laws and equations you can read in the textbook; in the class you will learn the skills to apply them to problems and assess your answers. You will acquire these skills by actively working in groups to work through tutorials and solve problems. You will be learning from your group mates, from our Learning Assistant and Graduate Teaching Assistant, and from myself.

Outside of class, you are encouraged to come to office hours for help on any aspect of the course. Also, our Learning Assistants and Graduate Assistant are happy to help – just talk to them after class, email them, or head down to the Physics Lounge (room 111) where other physics students are happy to help.

A note about asking questions: Just because you read the textbook and work the problems doesn't mean you'll understand the material completely. You will frequently have questions to ask my LAs, GAs and I. If you have done sufficient reading and working on the subject, you will be able to ask very specific questions that we can help you with. For example:

Do ask questions like "I don't understand how to choose the variable to integrate over when applying Coulomb's law to calculating the electric field of extended charge distributions"

Do not ask questions like "I don't get Coulomb's law. What's the deal with it?"

The latter question tells me you haven't put any effort into understanding the material, and is too vague for me to answer.

To succeed in this class

The biggest predictor for success in this (and any) class is the time, thoroughness, and effort you put into the work and reading set. The harder you work, the better you'll do. Therefore you need to aim to

- Attend all classes, and participate fully in group work
- Complete and turn in all the work on time
- Read the textbook thoroughly, in the most efficacious way (see above)
- Take advantage of all the extra credit
- Ask for help when needed, and make sure you questions are specific

Student Responsibilities

Students are

The vast majority of class time will be spent working in groups. Students are expected to participate fully in group-work in their assigned roles.

Students are expected to have completed the reading by the due date (see the end of the syllabus for the due dates of the first reading quizzes.)

Students are expected to take notes on all problems you solve in class, any notes shared by other groups on whiteboards. For work displayed on whiteboards, the easiest thing to do is to just take photos of the work using camera phones. All students are expected to complete the tutorial worksheets; although the in-class tutorials are not graded, you will need complete worksheets to do the tutorial homework and to revise for the exams.

GRADING

Item	Percentage of Class Grade
In-class/reading assignments	15%
Tutorial Homeworks	15%
MasteringPhysics (Online) Homework	15%
Midterm exams	40% (5 x 8%)
Final	15%

In addition, occasional extra credit assignments will be given, which will add up to no more than an extra 3%. The first small piece of extra credit will be given to any who come and introduce themselves to me during office hours during the first 2 weeks of classes. Your current grade at any time during the semester can be found in the gradebook in MasteringPhyiscs.

Grading scale: (**NOTE:** Grades are not curved in this class – what you get is what you get!)

90 % < A
80 % < B < 89.9999 %
70 % < C < 79.9999 %
60 % < D < 69.9999 %
F < 60%

Assessments

See the course calendar at the end of this syllabus for a complete list of class and exam dates (note: these are estimates – the dates are likely to change), and the first few homework due dates.

General: **The problem solving rubric** summarizes how I want you to approach all problem solving. **Keep a copy with you at all times.** In-class assignments, some homework problems, and some exam problems will be graded according to this rubric, and it is generally a good guide to approaching problem solving in college and beyond.

Exams: There will be five midterms and a final. See the course outline for *estimates* of exam dates. Make-up exams will only be allowed for excused absences. See course policies below for details on excused absences. You will be allowed "cheat sheets" prepared by you in each exam – one piece of letter-sized paper (front and back) with any formulas, examples, and anything else you feel like putting there.

ALL types of problems you encounter in class or on homework will be encountered on exams – everything you do is essentially practicing towards the exam.

If everyone in a particular group makes a 75 or more on the exam, each student will get a bonus 5 points.

MasteringPhysics Homework: about 11 homework assignments will be assigned throughout the semester. Homework will be submitted through the MasteringPhysics online homework system. The due date will be displayed in MasteringPhysics and announced in class. The **MasteringPhysics homeworks will be due at 11.59pm.**

.

Tutorials Homework: About 10 homework assignments will be assigned throughout the semester from the, "*Tutorials in Introductory Physics"* homework book. Homework is due at the beginning of class. Late homework will not be accepted. Your lowest tutorial homework grade will be dropped. Tutorial homework will generally be due **two classes** after it is assigned. **NOTE:** Tutorial homework solutions are not distributed; questions that posed particular difficulty will be discussed in class (you are welcome to suggest questions to discuss). If you have questions about a particular solution, you should ask me during office hours. Tutorial homework is graded according to the rubric given at the end of the syllabus.

In-class/reading assignments: The online reading quizzes are worth about one quarter of this particular grade. The rest of the grade is from a combination of in-class problem solving (graded according to the problem solving rubric at the end of the syllabus) and occasional labs worksheets (some of which will be graded according to the lab rubric given at the end of the syllabus). Assignments will be completed as a group, and each member will receive the group score, modified by the results of peer assessment. More information about how in-class work is graded will be provided in a separate document. Your lowest in-class assignment grade and reading quiz will be dropped. **NOTE:** I do not distribute solutions to the in-class problems, so make sure you take notes as you are doing the problems, and when we discuss them afterwards. **NOTE II:** In-class assignments that you miss due to absences cannot be made up.

TECHNOLOGY REQUIREMENTS

In order to access the MasteringPhysics online homework system, you will need access to the internet and a web browser. All lectures will be posted online on the MasteringPhysics website.

COURSE AND UNIVERSITY PROCEDURES/POLICIES

1. Cell phone use is only allowed if used for class activities.

2. **Eating is not allowed**. However, covered drinks are allowed.

3. Attendance will be taken by seating chart at the beginning of class.

4. The instructor must be notified by email about any excused absences **no later than 24 hours after the missed class**. Even if you choose to notify the instructor in person, you **must still follow up with email** within 24 hours of the missed class. If you do not follow this policy, you will not be able to make up missed exams or turn in late work except in extreme circumstances. Excused absences include those for illness, school-sponsored events, other emergencies deemed unavoidable by the instructor.

5. You are responsible for obtaining notes and class announcements from missed classes.

6. Excessive absences may result in being dropped from the course.

7. When emailing the instructor, include the **course and section number in the subject line**. Include all relevant information, and write clearly, and double check your email to make sure grammar and spelling are correct (this is good advice beyond college: if you email prospective employers, and include poor spelling and bad grammar, they are unlikely to give you the time of day - get in the habit now, when the stakes are not as high).

9. You are expected to check your email at least once a day for class announcements. Emails will be sent to the email addresses you provided to MyLeo. Notify the instructor if you would prefer to receive emails at a different address.

11. Students should fully participate in class activities.

12. Students are expected to be professional and respectful and take responsibility for their learning. If you find yourself struggling, the instructor, GA and LAs are available to provide extra help outside of class.

Syllabus Change Policy

The syllabus is a guide. Circumstances and events, such as student progress, may make it necessary for the instructor to modify the syllabus during the semester. Any changes made to the syllabus will be announced in advance.

Student Conduct

All students enrolled at the University shall follow the tenets of common decency and acceptable behavior conducive to a positive learning environment. (See current Student Guidebook*).*
Students should also consult the Rules of Netiquette for more information regarding how to interact with students in an online forum: Netiquette http://www.albion.com/netiquette/corerules.html

ADA Statement

Students with Disabilities

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you have a disability requiring an accommodation, please contact:

Office of Student Disability Resources and Services

Texas A&M University-Commerce
Gee Library- Room 132
Phone (903) 886-5150 or (903) 886-5835
Fax (903) 468-8148
Email: Rebecca.Tuerk@tamuc.edu

Website: Office of Student Disability Resources and Services
http://www.tamuc.edu/campusLife/campusServices/studentDisabilityResourcesAndServices/

Nondiscrimination Notice

Texas A&M University-Commerce will comply in the classroom, and in online courses, with all federal and state laws prohibiting discrimination and related retaliation on the basis of race, color, religion, sex, national origin, disability, age, genetic information or veteran status. Further, an environment free from discrimination on the basis of sexual orientation, gender identity, or gender expression will be maintained.

Harassment Policy

Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, etc. If you or someone you know has been harassed or assaulted, you can find the appropriate resources here:

University Title IX Contact: Michele Vieira, 903-886-5025,
mailto:TitleIX@tamuc.edu

University resource webpages:
http://www.tamuc.edu/facultyStaffServices/humanResources/title-ix/resources.aspx

http://www.tamuc.edu/campuslife/campusServices/universityPoliceDepartment/crimePrevention/sexualAssault.aspx

University Counseling Center: 903-886-5145, http://www.tamuc.edu/campusLife/campusServices/counselingCenter/default.aspx

Campus police: mailto:upd@tamuc.edu, call 911 in emergency situations

External resources:

Crisis center of NorthEast Texas: http://www.ccnetx.org
Know you IX: http://knowyourix.org
End rape on campus: http://endrapeoncampus.org
Clery Center for Security on Campus: http://clerycenter.org
Not Alone: https://www.notalone.gov

Campus Concealed Carry Statement

Texas Senate Bill - 11 (Government Code 411.2031, et al.) authorize the carrying of a concealed handgun in Texas A&M University-Commerce buildings only by persons who have been issued and are in possession of a Texas License to Carry a Handgun. Qualified law enforcement officers or those who are otherwise authorized to carry a concealed handgun in the State of Texas are also permitted to do so. Pursuant to Penal Code (PC) 46.035 and A&M-Commerce Rule 34.06.02.R1, license holders may not carry a concealed handgun in restricted locations. For a list of locations, please refer to:

http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/34SafetyOfEmployeesAndStudents/34.06.02.R1.pdf

and/or consult your event organizer). Pursuant to PC 46.035, the open carrying of handguns is prohibited on all A&M-Commerce campuses. Report violations to the University Police Department at 903-886-5868 or 9-1-1.

COURSE OUTLINE / CALENDAR

This schedule is intended as a rough guide only, and is subject to change; all due dates will be announced in class several times. Other than weeks of

tests, you will always have a Mastering Physics homework due each Friday at midnight. You can fill in the blanks as they are announced in-class.

Date	Topic	Homeworks/Reading/Things to Remember	Chapter
M Aug 28	Introduction		
W Aug 30	Introduction/Electric charge and forces		25
F Sept 1	Electric charge and forces		25
W Sept 6	Electric charge and forces		25
F Sept 8	Electric charge and forces	Mastering Physics HW1 Deadline 11:59pm Tutorial HW 1 Due in class	25
M Sept 11	Electric charge and forces		25
W Sept 13	**TEST 1/**Review of test and progress		26
F Sept 15	Electric Field and Flux		26
M Sept 18	Electric Field and Flux		26
W Sept 20	Electric Field and Flux		26
F Sept 22	Gauss' Law		
M Sept 25	Gauss' Law		27
W Sept 27	Gauss' Law		27
F Sept 29	Gauss' Law		27
M Oct 2	**TEST 2/**Review of test and progress		27
W Oct 4	Electric Potential		28
F Oct 6	Electric Potential		28
M Oct 9	Electric Potential		28
W Oct 11	Electric Potential		28
F Oct 13	Capacitance		29
M Oct 16	Capacitance		29
W Oct 18	Capacitance		29
F Oct 20	Capacitance/**TEST 3**		
M Oct 23	Current, Resistance, RMF		30
W Oct 25	Current, Resistance, RMF		30

F Oct 27	Current, Resistance, RMF		30
M Oct 30	Current, Resistance, RMF		30
W Nov 1	Capacitance in circuits		29
F Nov 3	Capacitance in circuits/DC Circuits		29/31
M Nov 6	DC Circuits		31
W Nov 8	DC Circuits		31
F Nov 10	DC Circuits/**TEST 4**		31
M Nov 13	Magnetic fields and forces		32
W Nov 15	Magnetic fields and forces		32
F Nov 17	Magnetic Fields and forces		
M Nov 20	Magnetic fields and forces/**TEST 5**		32
W Nov 22		**THANKSGIVING**	
F Nov 24		**THANKSGIVING**	
M Nov 27	Sources of magnetic field		33
W Nov 29	Sources of magnetic field		33
F Dec 1	Induction		34
M Dec 4	Induction		34
W Dec 6	Induction		34
F Dec 8	Induction		34
DEC 13	**FINAL 10:30-12:30**		