



PHYS 532.01W Electricity and Magnetism for Educators

COURSE SYLLABUS: Spring 2016

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Preferred Form of Communication: Email

Communication Response Time: Within 24 hours on weekdays and 48 hours on weekends

COURSE INFORMATION

Required Textbook – D.J. Griffiths, *Introduction to Electrodynamics* (4th edition) (ISBN:978-0-321-85656-2)

Recommended book – Tallarida, *Pocket book of Integrals and Mathematical Formulas*, 4th edition (2008) (ISBN-13: 978-1420063042)
This book is a useful reference containing trigonometric identities, integral tables, etc. You may use it on exams.

Readings – A list of readings is included at the end of the syllabus.

Course Description

This course covers electromagnetism from a variety of perspectives. While the course will include traditional advanced electricity and magnetism content, history of electromagnetism, current events in physics, and physics education research relevant to electricity and magnetism will be discussed.

Note that the traditional advanced E&M content requires calculus, including multivariable calculus. Review resources will be provided at the beginning of the semester. The first two weeks of class will include review of vector calculus.

Syllabus/schedule subject to change

University Catalogue Description

Topics include vector analysis, electrostatics, electric fields, magnetostatics, magnetic fields, and electrodynamics. Connections to modern applications will be explored. Emphasis will be placed on conceptual understanding.

Student Learning Outcomes

1. Students will be able to analyze the divergence and curl of electric and magnetic fields.
2. Students will be able to apply Coulomb's Law and Gauss's Law.
3. Students will be able to apply the Biot-Savart Law and Ampere's Law.
4. Students will be able to discuss the application of findings of physics education research to their own classrooms.
5. Students will be able to incorporate history and current events in physics into their own teaching.

COURSE REQUIREMENTS

Instructional / Methods / Activities Assessments

Each week, a video will be uploaded about the week's advanced electricity and magnetism content. There will be points during each video during which you should pause and work the sample problems before continuing to watch the video. A discussion board can be found under each week for you to discuss working these problems and your homework problems. A document will be uploaded containing prompts for your reading reflection. A discussion board can be found under each week for you to discuss the reading assignment. Problem set homework and reading reflection homework will be due *approximately* every other week. See the schedule at the end of the syllabus. There will be 2 midterms and a final covering the advanced electricity and magnetism content. The final is not cumulative.

Student Responsibilities

Students are expected to watch the videos, participate in all discussions, complete all homework assignments, and complete all exams. Students are to be aware of all deadlines and ask questions when directions are unclear.

GRADING

Final grades in this course will be based on the following scale:

A = 90%-100%

B = 80%-89%

C = 70%-79%

D = 60%-69%

F = 59% or Below

Assessments

Grades will be based on 5 components:

40% Exams

15% Problem set homework

20% Reading reflection homework

5% Problem discussion

20% Reading discussion

Exams: There will be 2 midterms and a final. They will be weighted equally, so each exam is worth 13.3% of your overall grade. See exam due dates at the end of the syllabus. The exams will be made available one week before the due date. The exams have a 2 hour time limit. It is your responsibility to set aside a time when you can complete the exam and follow the time limit. Exams will be closed book, but you may use a 2-sided 8.5"x11" crib sheet. You may also use the pocket book of integrals or similar printouts from the internet of integral tables, the unit circle, and series tables. Information will be with suggestions for such references. You will complete exams on your own paper and then either scan them or take their picture and submit them via the DropBox. Submit your crib sheets along with your exams.

Problem set homework: Problem sets will be assigned approximately every other week. See the schedule at the end of the syllabus. Problem sets will be made available no later than one week before the due date. A random subset of homework problems will be graded. Assignments will be graded 70% for effort and 30% for correctness. For example, if you fully attempted each problem but every answer was incorrect, you would receive a grade of 70. You will complete problem sets on your own paper and then either scan them or take their picture and submit them via the DropBox. You are strongly encouraged to discuss your problem set homework with fellow classmates on the class discussion boards. Problem set solutions will be made before exams.

Reading reflection homework: Reading assignments will be due approximately every other week. See the schedule at the end of the syllabus. Each reading assignment will be an article about history, current events, or physics education research. You will write a reading reflection based on the assigned prompts. A random prompt from each assignment will be graded. A document will be made available containing the rubric for how reading reflection homework will be graded. You should submit your reading reflection as either a Word document or a pdf document through the DropBox.

Problem discussion: You are expected to participate in the problem discussions either to discuss the sample problems or to discuss the problem set homework. A random selection of problem discussions will be graded. A document called Problem Discussion Rubric will be made available so that you understand how you will be graded for your participation in this discussion. Problem discussions will open on Wednesdays and close on the following Wednesday. You must make your first post in the problem discussion forum no later than Monday at noon.

Reading discussion: You are expected to participate in discussions about the reading assignments. A random selection of reading discussions will be graded. A document called Reading Discussion Rubric will be made available so that you understand how you will be graded for your participation in this discussion. Reading discussions will open on the Wednesdays when reading reflection homeworks are due and will close on the following Wednesday. You must make your first post in the reading discussion forum no later than Monday at noon, and you must write at least three posts total.

TECHNOLOGY REQUIREMENTS

- You must have access to a scanner or a phone that takes scanner quality images in order to turn in problem set homework and exams.
- You must have access to Skype to participate in office hours.
- To fully participate in online courses you will need to use a current Flash enabled browser. For PC users, the suggested browser is Google Chrome or Mozilla Firefox. For Mac users, the most current update of Firefox is suggested.
- You will need regular access to a computer with a broadband Internet connection. The minimum computer requirements are:
 - 512 MB of RAM, 1 GB or more preferred

- Broadband connection required courses are heavily video intensive
- Video display capable of high-color 16-bit display 1024 x 768 or higher resolution
- You must have a:
 - Sound card, which is usually integrated into your desktop or laptop computer
 - Speakers or headphones.
 - *For courses utilizing video-conferencing tools and/or an online proctoring solution, a webcam and microphone are required.
- Both versions of Java (32 bit and 64 bit) must be installed and up to date on your machine. At a minimum Java 7, update 51, is required to support the learning management system. The most current version of Java can be downloaded at: [JAVA web site](http://www.java.com/en/download/manual.jsp)
<http://www.java.com/en/download/manual.jsp>
- Current anti-virus software must be installed and kept up to date.
- Run a browser check through the Pearson LearningStudio Technical Requirements website. [Browser Check](http://help.ecollege.com/LS_Tech_Req_WebHelp/en-us/#LS_Technical_Requirements.htm#Browset)
http://help.ecollege.com/LS_Tech_Req_WebHelp/en-us/#LS_Technical_Requirements.htm#Browset

Running the browser check will ensure your internet browser is supported.

Pop-ups are allowed.

JavaScript is enabled.

Cookies are enabled.

- You will need some additional free software (plug-ins) for enhanced web browsing. Ensure that you download the free versions of the following software:
 - [Adobe Reader](https://get.adobe.com/reader/) <https://get.adobe.com/reader/>
 - [Adobe Flash Player](https://get.adobe.com/flashplayer/) (*version 17 or later*)
<https://get.adobe.com/flashplayer/>
 - [Adobe Shockwave Player](https://get.adobe.com/shockwave/) <https://get.adobe.com/shockwave/>
 - [Apple Quick Time](http://www.apple.com/quicktime/download/) <http://www.apple.com/quicktime/download/>
- At a minimum, you must have Microsoft Office 2013, 2010, 2007 or Open Office. Microsoft Office is the standard office productivity software utilized by faculty, students, and staff. Microsoft Word is the standard word processing software, Microsoft Excel is the standard spreadsheet software, and Microsoft PowerPoint is the standard presentation software.

Copying and pasting, along with attaching/uploading documents for assignment submission, will also be required. If you do not have Microsoft Office, you can check with the bookstore to see if they have any student copies.

- For additional information about system requirements, please see: [System Requirements for LearningStudio](https://secure.ecollege.com/tamuc/index.learn?action=technical)
<https://secure.ecollege.com/tamuc/index.learn?action=technical>

ACCESS AND NAVIGATION

Pearson LearningStudio (eCollege) Access and Log in Information

This course will be facilitated using Pearson LearningStudio, the learning management system used by Texas A&M University-Commerce. To get started with the course, go to [myLeo](http://www.tamuc.edu/myleo.aspx). <http://www.tamuc.edu/myleo.aspx>

You will need your CWID and password to log in to the course. If you do not know your CWID or have forgotten your password, contact Technology Services at 903.468.6000 or helpdesk@tamuc.edu.

It is strongly recommended that you perform a "Browser Test" prior to the start of your course. To launch a browser test, login to Pearson LearningStudio, click on the "My Courses" tab, and then select the "Browser Test" link under Support Services.

Pearson Learning Studio Student Technical Support

Texas A&M University-Commerce provides students technical support in the use of Pearson LearningStudio.

Technical assistance is available 24 hours a day/ 7 days a week.

If at any time you experience technical problems (e.g., you can't log in to the course, you can't see certain material, etc.) please contact the Pearson LearningStudio Help Desk, available 24 hours a day, seven days a week.

The student help desk may be reached by the following means 24 hours a day, seven days a week.

- **Chat Support:** Click on '*Live Support*' on the tool bar within your course to chat with a Pearson Learning Studio Representative.

- **Phone:** 1-866-656-5511 (Toll Free) to speak with Pearson Learning Studio Technical Support Representative.

Accessing Help from within Your Course: Click on the *'Tech Support'* icon on the upper left side of the screen inside the course. You then will be able to get assistance via online chat, email or by phone by calling the Help Desk number noted below.

Note: Personal computer problems do not excuse the requirement to complete all course work in a timely and satisfactory manner. Each student needs to have a backup method to deal with these inevitable problems. These methods might include the availability of a backup PC at home or work, the temporary use of a computer at a friend's home, the local library, office service companies, an Internet cafe, or a bookstore, such as Barnes & Noble, etc.

Policy for Reporting Problems with Pearson LearningStudio

Should students encounter Pearson LearningStudio based problems while submitting assignments/discussions/comments/exams, the following procedure **MUST** be followed:

1. Students must report the problem to the help desk. You may reach the helpdesk at 1-866-656-5511.
2. Students **MUST** file their problem with the helpdesk and obtain a helpdesk ticket number
3. Once a helpdesk ticket number is in your possession, students should email me to advise me of the problem and to provide me with the helpdesk ticket number
4. At that time, I will call the helpdesk to confirm your problem and follow up with you

PLEASE NOTE: Your personal computer/access problems are not a legitimate excuse for filing a ticket with the Pearson LearningStudio Help Desk. You are strongly encouraged to check for compatibility of your browser **BEFORE** the course begins and to take the Pearson LearningStudio tutorial offered for students who may require some extra assistance in navigating the Pearson LearningStudio platform. **ONLY** Pearson LearningStudio based problems are legitimate.

myLeo Support

Your myLeo email address is required to send and receive all student correspondence. Please email helpdesk@tamuc.edu or call us at 903-468-

6000 with any questions about setting up your myLeo email account. You may also access information at [myLeo](https://leo.tamuc.edu). <https://leo.tamuc.edu>

Learner Support

Go to the following link [One Stop Shop](http://www.tamuc.edu/admissions/onestopshop/)- created to serve you by attempting to provide as many resources as possible in one location.

<http://www.tamuc.edu/admissions/onestopshop/>


Go to the following link [Academic Success Center](http://www.tamuc.edu/campusLife/campusServices/academicSuccessCenter/)- focused on providing academic resources to help you achieve academic success.

<http://www.tamuc.edu/campusLife/campusServices/academicSuccessCenter/>

FREE MOBILE APPS

The Courses apps for phones have been adapted to support the tasks students can easily complete on a smaller device. Due to the smaller screen size course content is not presented.

The Courses app is free of charge. The mobile Courses Apps are designed and adapted for different devices.

	App Title:	iPhone – Pearson LearningStudio Courses for iPhone Android – LearningStudio Courses - Phone
	Operating System:	iPhone - OS 6 and above Android – Jelly Bean, Kitkat, and Lollipop OS
	iPhone App URL:	https://itunes.apple.com/us/app/pearson-learningstudio-courses/id977280011?mt=8
	Android App URL:	https://play.google.com/store/apps/details?id=com.pearson.lsp_hone

Once downloaded, search for Texas A&M University-Commerce, and it should appear on the list. Then you will need to sign into the myLeo Mobile portal.

The Courses App for Android and iPhone contain the following feature set:

- View titles/code/Instructor of all Courses enrolled in online
- View and respond to all discussions in individual Courses
- View Instructor Announcements in individual Courses
- View Graded items, Grades and comments in individual Courses
- Grade to Date
- View Events (assignments) and Calendar in individual Courses

- View Activity Feed for all courses
- View course filters on activities
- View link to Privacy Policy
- Ability to Sign out
- Send Feedback

LEARNINGSTUDIO NOTIFICATIONS

Students can be alerted to course activities via text on their mobile phones or up to two email addresses.

To begin setting up notifications, go into your course in LearningStudio and click on the bell-shaped Notifications icon on the main menu ribbon.

By default the student's university email address will appear. This cannot be changed in LearningStudio. Additional email addresses may be added by clicking the Add button. After all of the other selections are completed be sure to click the Save and Finish button.

COMMUNICATION AND SUPPORT

Interaction with Instructor Statement

The best method to reach the instructor is through email. There is an email link in eCollege, or you can send an email to robynne.lock@tamuc.edu with PHYS 530 in the subject line.

The instructor will also be available through the virtual office for general questions.

The instructor will hold office hours on AdobeConnect or Skype on Tuesdays 5:00-6:00 pm, and by appointment. When office hours are held through AdobeConnect, the URL will be posted in class announcements. When office hours are held on Skype, you can find the instructor by the username robynne.lock. The method for office hours will be posted in class announcements a week in advance.

The instructor will participate on class discussion boards. Please restrict these discussion boards to their labeled topics.

COURSE AND UNIVERSITY PROCEDURES/POLICIES

Course Specific Procedures

1. You are responsible for knowing when all deadlines are.

2. You are responsible for asking for clarification whenever directions are unclear to you.
3. When emailing the instructor, include the course number in the subject line.
4. You are expected to check eCollege for class announcements at least once a day.
5. You are expected to check your email at least once every 48 hours for messages from the instructor. 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.
6. Homework and exams are due by 11:59 pm on the specified due dates. Late homework will be accepted up to a week late at 50% off. Late exams will not be accepted except in extenuating circumstances.
7. Students are expected to be professional and respectful and follow netiquette.

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.

University Specific Procedures

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](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/)

<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.

COURSE OUTLINE / CALENDAR

Advanced Electricity and Magnetism Content Schedule

Weeks are labeled by the Monday of each week. Math content videos will be uploaded by Wednesday at noon of each week.

2/1	Week 0: Introduction
2/8	Week 1: Vector calculus review and application
2/15	Week 2: Vector calculus review and application
2/22	Week 3: Electrostatics
2/29	Week 4: Electrostatics
3/7	Week 5: Electrostatics
3/14	Spring Break
3/21	Week 6: Magnetostatics
3/28	Week 7: Magnetostatics
4/4	Week 8: Electrodynamics
4/11	Week 9: Electrodynamics
4/18	Week 10: Electrodynamics
4/25	Week 11: Electromagnetic waves
5/2	Week 12: Electromagnetic waves

Problem Set Homework Deadlines:

Problem sets will be made available at least one week before the due date.

Homework 1: Vector calculus	2/24
Homework 2: Electrostatics I	3/9
Homework 3: Electrostatics II and Magnetostatics I	4/4
Homework 4: Magnetostatics II and Electrodynamics I	4/20
Homework 5: Electrodynamics II and EM waves	5/4

Reading Schedule:

Reading reflection homework prompts will be based on the following readings. You will not be required to read all of the articles listed. For many assignments, you will be asked to select a subset of articles from the list.

Homework 1: History

- G. Hall, "Maxwell's electromagnetic theory and special relativity," *Phil. Trans. R. Soc. A* 366, 1849 (2008).
- B. Franklin, "Letter XI," In *Benjamin Franklin's experiments and observations on electricity* (pp. 265-266), Cambridge, MA: Harvard University Press (1941).
- J.C. Maxwell. "On Faraday's lines of force," In *A dynamical theory of the electromagnetic field* (pp. 157-159). Edinburgh: Scottish Academic Press (1982).

Homework 2: Physics Education Research

- T.M. Scaife and A.F. Heckler, "Interference between electric and magnetic concepts in introductory physics," *Phys. Rev. ST – Phys. Ed. Res.* 7, 010104 (2011).
- J.M. Casperson and M.C. Linn, "Using visualizations to teach electrostatics," *American Journal of Physics* 74, 316 (2006).

Homework 3: Current events and real-world applications

- J. Zavisla "How Van de Graaff Generators Work" 1 April 2000. HowStuffWorks.com.
<<http://science.howstuffworks.com/transport/engines-equipment/vdg.htm>> 13 January 2016.
- M. Schirber, "Focus: Electrons not the cause of charged grains," *Physics* 7, 58 (2014). DOI 10.1103/Physics.7.58.
- J. Zavisla "How Lightning Works" 1 April 2000. HowStuffWorks.com.
<<http://science.howstuffworks.com/nature/natural-disasters/lightning.htm>> 13 January 2016.
- "Static Electricity-Lesson 4-Electric Fields: Lightning," thePhysicsClassroom.com.
<<http://www.physicsclassroom.com/class/estatics/Lesson-4/Lightning>> 13 January 2016.

- P. Ball, "Focus: First spectrum of ball lightning," *Physics* 7, 5 (2014). DOI 10.1103/Physics.7.5.
- D. Voss, "Synopsis: A crackling in the air," 2 May 2013. [Physics.aps.org. <https://physics.aps.org/synopsis-for/10.1103/PhysRevLett.110.185005>](https://physics.aps.org/synopsis-for/10.1103/PhysRevLett.110.185005) 13 January 2016.

Homework 4: Current events

- J. Morgan, "Elusive magnetic 'monopole' seen in quantum system," 30 January 2014. [BBC.com. <http://www.bbc.com/news/science-environment-25946734>](http://www.bbc.com/news/science-environment-25946734) 13 January 2014.
- E. Cartlidge, "Magnetic monopoles seen in the lab," 30 January 2014. [Physicsworld.com <http://physicsworld.com/cws/article/news/2014/jan/30/magnetic-monopoles-seen-in-the-lab>](http://physicsworld.com/cws/article/news/2014/jan/30/magnetic-monopoles-seen-in-the-lab) 13 January 2014.
- E. Gibney, "Quantum cloud simulates magnetic monopole," 29 January 2014. [Nature News. <http://www.nature.com/news/quantum-cloud-simulates-magnetic-monopole-1.14612>](http://www.nature.com/news/quantum-cloud-simulates-magnetic-monopole-1.14612) 13 January 2016.
- "Physicists create synthetic magnetic monopole predicted more than 80 years ago," 29 January 2014. [Phys.org. <http://phys.org/news/2014-01-physicists-synthetic-magnetic-monopole-years.html>](http://phys.org/news/2014-01-physicists-synthetic-magnetic-monopole-years.html) 13 January 2016.
- A. Geim, "Everyone's magnetism," *Physics Today*, Sep. 1998, pp. 36-39.

Homework 5: Physics Education Research

- N.D. Finkelstein, W.K. Adams, C.J. Keller, P.B. Kohl, K.K. Perkins, N.S. Podolefsky, and S. Reid, "When learning about the real world is better done virtually: A study of substituting computer simulations for laboratory equipment," *PRST-PER* 1, 010103 (2005).

Homework 6: Physics Education Research

- N.S. Podolefsky and N.D. Finkelstein, "Use of analogy in learning physics: The role of representations," *PRST-PER* 2, 020101 (2006).

Reading Reflection Homework Deadlines:

Reading assignments will be made available at least one week before the due date.

Homework 1	2/17
Homework 2	3/2
Homework 3	3/23
Homework 4	4/6
Homework 5	4/27
Homework 6	5/6

Exam due dates: Exams will be made available 1 week before the deadline.

Midterm 1 3/23

Midterm 2 4/20

Final 5/11