



# PHYS 530.01W Physics Mathematical Methods for Educators

## COURSE SYLLABUS: Fall 2016

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**Preferred Form of Communication:** Email

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

## COURSE INFORMATION

**Required Textbook** – Felder & Felder, *Mathematical Methods in Engineering and Physics* (2016) (etext ISBN: 978-1-119-04581-6; paperback ISBN: 978-1-118-44960-8)

**Recommended book** – Tallarida, *Pocket book of Integrals and Mathematical Formulas*

Any edition will work. This book is a useful reference containing trigonometric identities, integral tables, etc. You may use it on exams.

**Readings** – All papers can be accessed online from the open access journal Physical Review Special Topics – Physics Education Research (<http://journals.aps.org/prstper/>).

Hu, "Using conceptual blending to describe how students use mathematical integrals in physics," PRST-PER 9, 020118 (2013).

Nguyen, "Students' understanding and application of the area under the curve concept in physics problems," PRST-PER 7, 010112 (2011).

*Syllabus/schedule subject to change*

Bing and Redish, "Analyzing problem solving using math in physics: Epistemological framing via warrants," PRST-PER 5, 020108 (2009).  
Karam, "Framing the structural role of mathematics in physics lectures: A case study of electromagnetism," PRST-PER 10, 010119 (2014).  
Christensen, "Investigating graphical representations of slope and derivative without a physics context," PRST-PER 8, 023101 (2012).  
Yerushalmi, "Instructors' reasons for choosing problem features in a calculus-based introductory physics course," PRST-PER 6, 020108 (2011).

### **Course Description**

This course covers mathematical techniques needed for advanced physics. Topics covered include series, complex numbers, linear algebra, differential equations, and vector calculus. Additionally, relevant physics education research literature is discussed.

### **University Catalogue Description**

Vectors and curvilinear coordinates, partial differential equations, linear and non-linear systems, matrix algebra, boundary value problems, Fourier transforms, separation of variables, Sturm-Liouville eigenfunction expansion theory, numerical techniques.

### **Student Learning Outcomes**

1. Students will be able to use complex numbers and linear algebra in physics contexts.
2. Students will be able to apply differential equations to physics problems.
3. Students will be able to use vector calculus in physics problems.
4. Students will be able to discuss the application of findings of physics education research to their own classrooms.

## **COURSE REQUIREMENTS**

### **Instructional / Methods / Activities Assessments**

Each week, a video will be uploaded about the week's mathematical techniques 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 introducing each reading assignment and 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 1 midterm and a final covering the math techniques 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:

30% Exams

15% Problem set homework

25% Reading reflection homework

5% Problem discussion

25% Reading discussion

Exams: There will be 1 midterm and a final. They will be weighted equally, so each exam is worth 15% 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 3 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. A document will be uploaded containing 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. 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. Problem Sets should be submitted as a single file. Do NOT upload several jpg files. You are strongly encouraged to discuss your problem set homework with fellow classmates on the class discussion boards. Problem set solutions will be made available less than 72 hours after the deadline.

**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 from Physical Review Letters – Special Topics Physics Education Research. You will write a reading reflection based on the assigned prompts. 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. Do not enter your assignment into the textbox on eCollege.

**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 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 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. At least two of these posts should be responses to other students' posts.

## 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](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](mailto: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](mailto: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.

	<b>App Title:</b>	<b>iPhone</b> – Pearson LearningStudio Courses for iPhone <b>Android</b> – LearningStudio Courses - Phone
	<b>Operating System:</b>	<b>iPhone</b> - OS 6 and above <b>Android</b> – Jelly Bean, Kitkat, and Lollipop OS
	<b>iPhone App URL:</b>	<a href="https://itunes.apple.com/us/app/pearson-learningstudio-courses/id977280011?mt=8">https://itunes.apple.com/us/app/pearson-learningstudio-courses/id977280011?mt=8</a>
	<b>Android</b>	



	<b>App URL:</b>	<a href="https://play.google.com/store/apps/details?id=com.pearson.lsp_hone">https://play.google.com/store/apps/details?id=com.pearson.lsp_hone</a>
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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](mailto: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. 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 robyne.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  
[StudentDisabilityServices@tamuc.edu](mailto:StudentDisabilityServices@tamuc.edu)

#### **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.

#### **Campus Concealed Carry**

Texas Senate Bill - 11 (Government Code 411.2031, et al.) authorizes 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.

### **Plagiarism**

Plagiarism is a criminal activity. You must cite all sources of information. Unreferenced copying of material, whether parts of sentences, whole sentences, paragraphs, or entire articles can result in a score of zero for your assignment and may result in further disciplinary action.

### **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 your 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>

## **COURSE OUTLINE / CALENDAR**

### Mathematical Techniques Content Schedule

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

8/29	Week 1: Calculus review
9/5	Week 2: Calculus review
9/12	Week 3: Introduction to ordinary differential equations
9/19	Week 4: Introduction to ordinary differential equations
9/26	Week 5: Series
10/3	Week 6: Complex numbers
10/10	Week 7: Linear algebra and vectors
10/17	Week 8: Linear algebra and vectors
10/24	Week 9: Divergence, curl, and vector fields
10/31	Week 10: Line integrals, surface integrals, and volume integrals
11/7	Week 11: Line integrals, surface integrals, and volume integrals
11/14	Week 12: Differential equations
11/21	Week 13: Thanksgiving
11/28	Week 14: Differential equations
12/5	Week 15: Differential equations

### Problem Set Homework Deadlines:

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

Homework 1: Calculus review	9/14
Homework 2: Intro to ordinary differential equations	9/28
Homework 3: Series and complex numbers	10/12
Homework 4: Linear algebra and vectors	11/2
Homework 5: Vector calculus	11/16
Homework 6: Differential equations	12/7

### Physics Education Research Reading Schedule:

Reading reflection homework prompts will be based on the following journal papers.

HW 1	Hu, "Using conceptual blending to describe how students use mathematical integrals in physics," PRST-PER 9, 020118 (2013).
HW 2	Nguyen, "Students' understanding and application of the area under the curve concept in physics problems," PRST-PER 7, 010112 (2011).
HW 3	Bing and Redish, "Analyzing problem solving using math in physics: Epistemological framing via warrants," PRST-PER 5, 020108 (2009).
HW 4	Karam, "Framing the structural role of mathematics in physics

- lectures: A case study of electromagnetism," PRST-PER 10, 010119 (2014).
- HW 5 Christensen, "Investigating graphical representations of slope and derivative without a physics context," PRST-PER 8, 023101 (2012).
- HW 6 Yerushalmi, "Instructors' reasons for choosing problem features in a calculus-based introductory physics course," PRST-PER 6, 020108 (2011).

Reading Reflection Homework Deadlines:

Homework 1	9/7
Homework 2	9/21
Homework 3	10/5
Homework 4	10/26
Homework 5	11/9
Homework 6	11/30

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

Midterm	10/19
Final	12/14