Course Syllabus

PHYS 3411.001 Theoretical Physics Fall 2016

Professor Contact Information

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The class meets on Mondays, Wednesdays & Fridays **from 1:00 – 2:15** in PHY 1.202. The final is scheduled by the University but hasn't arranged it yet…

Office hours

Instructor: MWF 3:00 to 4:00 or by appointment. This is just after class and if a class-member asks me questions in PHY 1.202, I'll talk to them **there**. This means that **'office hours' might happen in the classroom**. (However, if nobody asks me questions by 3:20, I'll feel free to leave.)

Many students that come to office hours ask me about homework questions. That's OK. If there are questions then those questions should be asked. However, I don't intend to do your homework for you. If I am asked about a homework problem then my response is often to ask you what you have done. Please be ready to write something. After talking to me, I intend that you'll be on-the-right-track to solve the problem yourself! On the other hand, many students from previous semesters should have gone to office hours but didn't. Don't expect that you can 'get-by' with minimal effort. What you get out of this class largely depends on your own efforts.

TA: TBA Hours; TBA

Course Pre-requisites, Co-requisites, and/or Other Restrictions

You need to have already done:

MATH 2418 (Linear Algebra) or equivalent
MATH 2415 (Calculus of Several Variables) or MATH 2419 (Calculus II), or MATH 2451
PHYS 2326 (Electromagnetism and Waves) or PHYS 2422 (Honors Physics II.)

You need to be doing:

MATH 2420 (Differential Equations with Applications) or equivalent.

PHYS 3411 is a pre-requisite for many other physics courses and needs to be thoroughly understood for success in the physics classes that follow it.

Course Description

PHYS 3411 Theoretical Physics (4 semester hours) Complex numbers; Vector spaces and linear operators; Line integrals; surface & volume integrals; Gradient, divergence & curl; vector integral theorems; Fourier series; Product solutions of PDEs

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Student Learning Outcomes

- Students will use 'index notation' (Cartesian only) to generate a proof of a given vector or matrix identity
- Students will Fourier-analyze functions into Fourier series. Given a function (of one variable), students will find infinite sets of Fourier coefficients.
- Given a physical model (that involves a partial differential equation and boundary conditions), students will construct a solution of the equation that fits the boundary conditions.

Required Textbooks and Materials

We will use the **book "Mathematical Methods in the Physical Sciences" by Mary L. Boas 3rd Edition, ISBN: 0-471-19826-9**. You can get it at the campus bookstore, off-campus books, etc…..) Here are 2 possible on-line sources:

Amazon:

http://www.amazon.com/s/ref=nb_sb_noss_1?url=search-alias%3Daps&field-keywords=mary+l+boas

Abebooks

http://www.abebooks.com/servlet/SearchResults?isbn=9780471198260&cm_sp=mbc-_-9780471198260-_-all

If you order the book on-line, please select a seller that is located in the United States. It will take a long to obtain the book from sellers in other countries

I will be assigning homework from the book and assume that you have access to it. I don't mind if you buy it new or used but I think that it is worth keeping the book if you will be doing more Physics courses.

Suggested Course Materials

You should have writing equipment at all meetings of the class. (You only need a 'scientific' calculator.)

Assignments & Academic Calendar

This class is not intended to be the same as other physics classes. PHYS 3411 is a class of <u>mathematical methods</u>. The practical application of those methods will often appear in <u>other</u> physics classes. The techniques developed in this course have been chosen by other members of the faculty who intend to use them in their courses.

One of the prerequisites is a course in linear algebra so I'll assume that you know much of the linear algebra in chapter three. While index notation is a topic in linear algebra, it is rarely done in many linear algebra courses. However, you need it in your physics courses so I'll spend time doing the topic. It appears in Boas' book but isn't very thoroughly developed there. ***I'll give you 'handouts' that I expect you to use***. This notation turns out to be a powerful tool that is useful in vector analysis. There aren't many textbook-references to this topic so you'll need to be sure to think about it yourself and ask me questions that arise.

I'll skip chapter four because the topics in this chapter have already been done in calculus II (MATH 2419) and/or calculus of several variables (MATH 2415). We'll study chapter five if time allows.

We will spend time on 'Classical Vector Analysis' (chapter six) and the vector integral theorems (also in chapter six). You'll constantly be meeting grad, div and curl in other physics courses and I'll continue to use index notation to get identities that involve these operators as well as other vector identities. **Index notation will appear again in connection with identities that involve grad, div and curl**. I have another handout to give you then. (It might also help if you read the article from the American Journal of Physics by A. Evett. I'll post it on eLearning). I want to do the sections about eigenvectors & eigenvalues at this stage.

Expansion of functions in series is an important idea in Physics. Not all physically interesting functions are 'well-behaved' (by which we often mean something like functions being continuous and differentiable everywhere). Expansion of functions as power series assumes that that they are. An important topic is the representation of physically interesting functions that aren't so well behaved. Surprisingly, this can often be done by writing a function as the sum of a series of *sines* and *cosines* – a Fourier Series. We'll see how to do this in Chapter seven.

While the differential equations of immediate physical interest are (usually) Partial Differential equations (PDEs), Chapter 12 (Ordinary Differential Equations) is necessary before solving them. I expect that you'll already be familiar with the content of Boas' chapter 8 (ODEs) but don't think that you'll be familiar with either Legendre's or Bessel's equation(s) or the properties of their solutions. (Using series to find a solution to a linear ODE often comes at the end of courses in ODEs (or doesn't appear) so I intend to include it. I'll do as many sections of this chapter as needed.

In chapter 13, we look at a technique that separates a PDE in *N* variables into *N* ODEs. Finding the solution to a PDE thus involves finding the solutions to the *N* ODEs. We will use this technique in Cartesian coordinates in the first sections of Chapter 13. In sections following 13.4, PDEs have to be solved in cylindrical and spherical (or circular) regions. While you are quite familiar with some ODEs, less familiar ODEs (Legendre's & Bessel's ODEs) arise in connection with separation of variables in these other regions.

Time permitting; we'll finish with the following;

- Complex Numbers (Chapter two),
- Separating variables in the wave equation.

Complex Numbers is a straight-forward chapter about the algebra of complex numbers and you may have seen some of it already. Solving the wave equation is similar to solving other PDEs from chapter 13 but might help by making you feel better about separating variables. Finding arbitrary coefficients in Fourier-Legendre Series is not an elementary topic. However, it increases the number of Boundary Value Problems that you can solve.

A **tentative** schedule for the course is as follows;

Day	Date	Meeting	Aims
Monday	Aug 22	1	Introduction
Wednesday	Aug 24	2	Handout: Beginning Index notation – section 3.2. Two kinds of indices & the Summation Convention, Kronecker delta,
Friday	Aug 26	3	Permutation/Levi-Civita symbol - in section 10.5. (There is no need to work beyond example 2 in 10.5!), Components of cross product Vector identities
Monday	Aug 29	4	Matrices Product in index notation (from section 3.6), Rotation matrices (first mentioned in sec. 3.6). Before we consider the length of a rotated vector, we need to look at 'transpose' in index notation. Handout: "More Useful Theorems" (from section 3.9*) - Transposes This leads to Orthogonal & Unitary Matrices.
Wednesday	Aug 31	5	Handout; Gradient, Divergence and Curl in 3D Cartesian coordinates & Index Notation. [Use 6.7 to remind yourself about grad, div and curl from your previous classes. **I'll post some questions about grad, div and curl that you'll need to be able to do**. Go through the small part of section 10.5 about curl. It is after example 2 and begins; "Recall from chapter 6…" You don't need to go through the subsection about dual tensors.]
Friday	Sept 2	6	Worksheet on identities
Monday	Sept 5		*Labor Day – no class*
Wednesday	Sept 7	7	Worksheet on identities - 1 to 4
Friday	Sept 9	8	Review of worksheet questions 5 to 8

* In section 3.9 Boas writes A^T_{ik} when she means the ik^{th} element of the matrix A^T. Please don't confuse this with $(a_{ik})^T$ [which is the transpose of the number a_{ik} and is almost always not what you need]. On the other hand, $(A^T)_{ik}$ is "the ik^{th} element of the matrix A^T" and probably is what you need.

Monday	Sept 12	9	Exercise with index notation; Orthogonality of eigenvectors & properties of both real symmetric & Hermitian matrices. (A table in 3.9 summarizes matrix types.) Matrices that represent deformations/physical transformations – in 3.11. Example of going from diagonal matrix M to non-diagonal M'. Transformations in a rotated frame - Diagonalizing Matrices Application of Diagonalization 3.12 (Work through the examples 1 & 2 about conic sections.)
Wednesday	Sept 14	10	5.4 transforming integrals from one coordinate system to another with Jacobians
Friday	Sept 16	11	6.4 Unit vectors in polar coordinates
Monday	Sept 19	12	6.9 Green's theorem (in the plane), 6.11 Stokes' theorem
Wednesday	Sept 21	13	Scalar Potential - finding a scalar potential given a conservative force. Boas gives examples 3 and 4 in section 6.8 on scalar potentials, 6.10 Divergence theorem. This theorem is motivated by Green's theorem in section 6.9)
Friday	Sept 23	14	**First Midterm**
Monday	Sept 26	15	7.1 Fourier Series (FS) for functions that are periodic in $(-\pi,\pi)$, 7.5 Coefficients for FS, Handout; Example of a FS.
Wednesday	Sept 28	16	7.6 Dirichlet's theorem (This is about convergence of FS). Handout; re-scaling to get FS for functions that are periodic in $(-l,l)$ - 7.8, 7.9 Integrals over symmetric intervals and parity. Extending from a definition on $(0,l)$ & a parity statement to a definition on $(-l,l)$
Friday	Sept 30	17	7.10 decomposition of a sound signal. [This is an example of FS for functions that are periodic in $(-l,l)$].
Monday	Oct 3	18	Complex FS from sine – cosine form & example [This is in 7.7 but I get the complex case directly from the sine/cosine form.]
Wednesday	Oct 5	19	7.11 - Parseval's theorem (using the complex exponential FS)
Friday	Oct 7	20	Parseval's theorem in the sine-cosine form. Example of Parseval's theorem. Handout: 12.5 - Multipole expansion of Electric Potential/Generating Function – Legendre's equation Handout: Recurrence relations for Legendre Polynomials. Parity and the 'special values': $P_n(\pm 1)$
Monday	Oct 10	21	Handout on series solutions for $y'' + y = 0$ - Section 12.1. [I use a method outlined by M. Spiegel that isn't the same as the method in the book!] Series solutions of Legendre's equation that converge. [Boas treats these in 12.2.]
Wednesday	Oct 12	22	Inner Product (IP) for functions (in section 3.14 after example 5.) Example of IP: complex FS as a decomposition on the basis $\{e^{inx}\}_{n=0}^{\infty}$. [Section 12.6 refers to this example!]
Friday	Oct 14	23	12.7 - Orthogonality of $\{P_n(x)\}_{n=0}^{\infty}$ 12.8 - Normalizing Legendre Polynomials 12.9 Legendre series
Monday	Oct 17	24	Need for an assumed solution; $y = \sum_n a_n x^{n+s}$ when assuming power series solutions. [Boas treats such ODEs in 12.11.] Handout: solving $36x^2y'' + (5 - 9x^2)y = 0$. Solving $\frac{d}{dr}\left(r\frac{dR}{dr}\right) = -k^2rR$ or $\frac{1}{rR}\frac{d}{dr}\left(r\frac{dR}{dr}\right) = \frac{p^2}{r^2} - k^2$; Bessel Functions are the solutions $R(r) = AJ_p(kr) + BN_p(kr)$.

Wednesday	Oct 19	25	Handout: Graphs and Roots (k_{0n}) of Bessel Functions - 12.14. Orthogonality of Bessel functions – result quoted
Friday	Oct 21	26	13.1 Partial Differential Equations (PDEs) ctd. 13.2 semi-infinite plate – solving PDEs by separating variables
Monday	Oct 24	27	13.2 semi-infinite plate continued
Wednesday	Oct 26	28	Handout of steps for solving PDEs. Worksheet on heat flow in a finite plate
Friday	Oct 28	29	Continue worksheet on heat flow in a finite plate
Monday	Oct 31	30	Review worksheet on the finite plate (I'll point out the two ways to finish this problem. Both have their advantages.)
Wednesday	Nov 2	31	[Superposition] Heat equation in a slab/rod of finite length 13.3, Worksheet on 13.3
Friday	Nov 4	32	**Second Midterm**
Monday	Nov 7	33	Worksheet on 13.3 ctd. Find c_n in $T = \sum_n c_n T_n$ for the **rod** problem using FS
Wednesday	Nov 9	34	Find c_n in $T = \sum_n c_n T_n$ for the **rod** problem using orthogonality. Showing the equivalent slab problem. Two separation constants 13.5 Separation in cylindrical coordinates
Friday	Nov 11	35	13.5 Separation in cylindrical coordinates Rejection of $N_p(kr)$ for the problem in 13.5 and getting separation constants $k = k_{0n}$.
Monday	Nov 14	36	13.6 Worksheet on drumhead
Wednesday	Nov 16	37	More 13.6 Worksheet on drumhead
Friday	Nov 18	38	Review drumhead problem
Monday	Nov 21	39	Handout on 13.7 (Separation of variables in spherical coordinates) Getting a <u>linear</u> transverse equation for 13.7 Legendre's equation.
Wednesday	Nov 23	40	Solving radial ODE in 13.7 Last BC in 13.7 to get to coefficients in Legendre series,
Friday	Nov 25	41	Calculus of variations ch 9 First example of Euler-Lagrange
Monday	Nov 28	42	Writing $F(x, y, y')$ or $F(y, x, x')$ to get easier Euler-Lagrange equations.
Wednesday	Nov 30		*Thanksgiving holiday*
Friday	Dec 2	43	Euler-Lagrange used to find a catenary and to find geodesics on a cone.
Monday	Dec 5	44	
Wednesday	Dec 7	45	
		A	2.1 – 2.2, 2.3, 2.4, 2.5,2.6 (Series), 2.9 (Euler's relation for e^{iy} where $y \in$ ∡)
		A	2.7(more series), 2.8 (Polar form) Defining e^z where $z \in$ ∐), Handout; an integral of complex quantities in 2.11, 2.12 (Hyperbolic functions)
		B	Wave equation 13.4 & Worksheet on 13.4
		Final (comprehensive) TBA by the University	

The University arranges the time for the final exam. Please check the UTD web page to check the scheduled time just before this exam.
http://www.utdallas.edu/student/registrar/finals/

I want to assign homework and will **I'll send the question numbers by email. With a few possible exceptions, assignments will be from the following list.**

Section	Question Numbers (Maximum points in parentheses)
3.2	1 (6), 2 (4)
3.6	18 (4) [I didn't find it useful to use index notation. Use her hint!]
3.9	2 (6) [Use index notation] (You can assume the distributive law for numbers.) 8 (6) [Use index notation.] 19 parts (a) and (c) (12) [Use index notation for both parts.] 23 (6) 24. As in eqn 6.10, M is an orthogonal matrix so that $M^T M = I$. The vector $\vec{r}$ is the usual position vector and $\vec{R} = M\vec{r}$ is the rotated position vector. First prove this using vector and matrix notation (6). Then write the proof of 3.9.24 with index notation (9)
3.11	11 (9) 18 (24) **Write** the following check on your calculations; Check that the sum of the eigenvalues equals the trace of the original matrix, and that the product of the eigenvalues equals the determinant of the original matrix. 31 (12), 38 (6) [She might have asked "Show that $(U^{-1}M^{\dagger}U)^{\dagger} = D$, where U is a unitary matrix and $D \equiv U^{-1}MU$."
3.12	3 (9), 4 (9)
5.4	2 (9) parts a, b and c, 7 (18), 13 (9), 20 [Give a diagram of the region of integration in the *x & y* coordinates and another in the *r & s* coordinates. I found her hints much more useful than problem 19] (18)
6.4	5 (6), 10 (9) [This question is easier if you do 6.4.9]
6.7	3 (6), 16 (6) 17 [**You must** use index notation to do the following parts] b (9), d (12), g (12), h (9), i (12), j (12) {The identities only need to be shown in rectangular coordinates. Use of section 9 from chapter 10 is not necessary. In part (j), think of the right-hand-side as involving two pairs of terms; the first and second terms and the third and fourth terms.} Assume $\left[(\vec{U}\cdot\vec{\nabla})\vec{V}\right]_p = u_t \partial_t v_p$ 19 (6) [When Boas gives $\vec{r} = x\hat{\imath} + y\hat{\jmath} + z\hat{k}$, I think that she just means that "$\vec{r}$ is the position vector". I don't think that she is insisting that you use Cartesian coordinates.]
6.8	7 part a (6), 7 part b (4), 7 part c (6), 12 (6) 16a (6)
6.9	1 (12) [The question should refer to fig. 9.1] , 11 (6) [The triangle is closed!]
6.10	8 (12), 14 (9)
6.11	2 (18), 6 (9), 12 (6) 6.12.22 (6) [yes, section 6.12!!]

	18 (24) The vector potential is not unique. Thus the vector $\vec{A}$ that you get may be correct but not be the same as Boas' answer. **You must calculate $\vec{\nabla} \times \vec{A}$** using the vector $\vec{A}$ that you have found.. If your answer is correct then you'll find that $\vec{\nabla} \times \vec{A}$ is the vector $\vec{V}$ that you started with.
7.5	3 (9), 6 (12), 11 (12)
7.6	3 (9), 14 (9)
7.7	1 (9), 11 (24)
7.8	2 (9) Only expand in a sine -cosine series, 12 (18),
7.9	2 [Do parts (a) and (b)], 23 (12)
7.10	2 Find coefficients of first six non-zero terms (9) , 8 (12)
7.11	9 (6)
12.1	7 (18), 6(18)
12.2	2 (6)
12.5	1 (6)
12.6	1 (6)
12.11	5 (18) [Any method of finding a series solution is acceptable.] Ans: <u>One</u> of the indicial roots gives $y=\sum_{n=0} a_n x^n = a_0 \left[1 - 2x + \frac{2}{3}x^2 - \frac{4}{3\times 15}x^4 + \cdots + \frac{(-1)^n 4^n}{(2n)!}x^n\right]$., 13 (12) [Any method of finding a series solution is acceptable.]
13.1	4 (12)
13.2	14 (18) 16 (12) [This is not a boundary value problem but is a claim about the uniqueness of solutions to Laplace's equation. Follow her hints.]
13.3	2 (18) [The bar is thin so it has only one dimension. It lies along the x-axis and only the curved surface is insulated. The response of the rod is not instantaneous so the temperature of both ends at t = 0 is still 100.]

I intend to post solutions on the eLearning site after the due date. **In general, late homework is not given credit**. (*Homework is late if it submitted after the beginning of the class in which it is due*.)

It is the policy and practice of The University of Texas at Dallas to make reasonable accommodations for students with properly documented disabilities. However, written notification from the Office of Student AccessAbility (OSA) is required. If you are eligible to receive an accommodation and would like to request it for this course, please discuss it with me and allow one week advance notice. Students who have questions about receiving accommodations, or those who have, or think they may have, a disability (mobility, sensory, health, psychological, learning, etc.) are invited to contact the Office of Student AccessAbility for a confidential discussion. OSA is located in the Student Services Building, suite 3.200. They can be reached by phone at (972) 883-2098, or by email at studentaccess@utdallas.edu.

To use eLearning, you have to have a login ID and password. The eLearning server is at https://elearning.utdallas.edu/webapps/portal/frameset.jsp Solutions are protected with a password. (It is the word ***methods.***) The intent of this password is to keep the solutions private to members of this class this semester. ***If you have any hard-copy solutions to problems in Boas' book, then I require that you destroy them (or give them to me) now.*** Copying solutions as a substitute for doing a problem yourself ***almost guarantees poor performance on exams***. It is intended that the solutions get you started so that you can produce a complete solution yourself. You'll need Adobe's Acrobat Reader to open them (http://www.adobe.com/products/acrobat/readstep2.html.)

- I do not intend to cover all sections in the text
- I do not intend to follow the order in which the material is presented in the text
- I intend to present some material in the text in a slightly different fashion from the text. Please take good notes!
- **Test** dates won't change. Content of tests may change but will not include material in chapters/sections that have not been treated in class.

Grading Policy:

I intend to use a grade scale as follows. If *x* is a score then,

$x \geq 95$	A+
$95 > x \geq 90$	A
$90 > x \geq 85$	A-
$85 > x \geq 75$	B+
$75 > x \geq 65$	B
$65 > x \geq 60$	B-

$60 > x \geq 55$	C+
$55 > x \geq 50$	C
$50 > x \geq 45$	C-
$45 > x \geq 40$	D+
$40 > x \geq 35$	D
$35 > x \geq 30$	D-
$30 > x$	F

Grades of **D+, D or D-** are not indications that the student should do further courses in the Physics department in the following semester. Such **course grades indicate that this course should be repeated.** (A grade of C doesn't indicate that all is well either.)

Weighting:	Homework	15%
	Midterm tests	25% each
	comprehensive Final Exam	35%

I do not intend to use a curve in my grading of individual tests. A grade of X (incomplete) is awarded if an unforeseen, non-academic emergency prevents a student from completing the work in a course. If an incomplete is given, the course must be completed within eight weeks of the first class day of the next long semester.

In general my tests are 'closed book' and 'closed notes'. ***I tend to embed reference material and some long equations in my tests***. I have found that the main difficulty with tests is not with remembering equations (though remembering helps!) but in knowing how to use them. **All books, notes, backpacks, cell phones, etc. are to be placed by the sides of the room during a test**. (By the way, *don't spend too long erasing mistakes when writing answers to* ***test*** *questions*. Begin again and **label the correct version** so that I can find it. Partial answers may tell me something.)

Use of ***scientific*** calculators is ***allowed on tests***. However, ***graphing and programmable calculators*** are ***not allowed***. None of the test questions that I ask will involve lots of number crunching. **Valid UT-D student cards must be available if requested during tests**. (You can get one made at the info depot in the student union building; SU 2.204.)

Missed tests can only be made up in the case of documented, extenuating circumstances. Such circumstances include medical emergencies and work-related travel that cannot be re-scheduled.

If a student wants to discontinue the course because a poor grade is expected, it is more appropriate for the student to withdraw from the course and re-register in another semester.

Course & Instructor Policies

Boas gives a bibliography at the end of her book. If you want more information about any of the topics that she covers then I suggest looking for these references in the library.

Homework in this class takes the form of doing sets of questions. I intend to send you an **e-mail** (on eLearning) on **Fridays** with **due** dates **on the Mondays at the beginning of class 10 days**

later. However, you don't have to wait for me to formally assign homework before you begin on the questions. ***As soon as we finish section 3.2, consider problems 3.2.1, and 3.2.2 to have been assigned etc***. as on the list of homework questions above (You will usually be right!).

Begin your homework as soon as you can because some problems are too difficult for a last-minute effort. Work out homework roughly before writing out a 'clean' version for submission as homework. ***The final version should explain what you are doing and not just contain calculations***. When grading your work, the grader will be trying to understand your reasoning. Help him/her by saying what you are trying to do! ***Homework with no comments or partly scratched out answers gets less credit***. (On the 'plus' side, taking the time to do this will give you a useful resource for exam review.) It should be written on paper with neat edges (rather than being on pages that are torn out of a spiral notebook. **Scratched out answers, partial erasing etc. is unacceptable**. **If your work can't be read then you should expect that your work will be returned with a request that you produce a neater version that the TA can read**. (Expect a 20% penalty if you are asked to rewrite your work.)

Please **staple** your homework together. Loose pages get lost among a pile of papers. Paperclips have their uses but they don't stay attached when in a pile of papers.

Feel free to form study groups etc but it is important to **hand in work that is your own**. ***At any point during the semester, I will feel free to ask any member of the class to explain any aspect of a homework problem to me.***

In addition to the homework problems that are handed in for grading, I suggest that you work problems other than homework problems. Get a notebook to be used for extra questions that you try that are not part of assigned homework. (Everyone should do more questions than the ones assigned for homework. (You'll want to know which questions to try. You can answer this by simply trying the question. If you can finish it then you have your answer! If you can't do the question then ask me. It may involve a topic in the book that 3411 doesn't include. But it might be very relevant but is just asked in a way that you don't expect.

Study methods:

Perhaps these suggestions are familiar to you already. At any rate, here they are.

Many people don't figure out how to study until late in their academic careers. One question to sort out is at what time you study best. Some prefer mornings before they get too busy with other things. Others prefer afternoon or evening. Find out which time suits you best and use that time!

Some people are under the impression that, to do much work, a long session of study is needed. While a few minutes are not enough for a study session, study in 30-minute sessions is useful. Despite the best of intentions, studying the same topic for several hours can involve lots of wasted time. The lack of an imminent deadline allows you to lose focus. People tend to be most productive at the beginning of a session (when they are still fresh) and near the end (as the deadline approaches). It is important to realize that you can still 'spend a few hours studying'. Just change topic when you get to the end of your 30-minute study period.

Before you begin studying, assemble all the materials (books, pens etc.) that you will need. Tightly scheduled 30-minute study periods don't include time to look for books, sharpen pencils and borrow calculators etc! Few of us work well when we are tired. Do feel free to schedule breaks in your study. Just make sure that the ‘breaks’ don’t get too long!

Make a (written) plan before you start to study. Your plan should sketch out what you want to accomplish. Unless you do, lots of time can be spent vaguely thinking about what to do next.) Make this plan as specific as possible: the more precise you are in your goals, the better you know if you reach them. Please be realistic about your aims for a study session. Rather than have a single goal of ‘getting an *A* in a certain course’, we often do better by establishing lots of minor goals that involve understanding certain sections of a text or doing certain problems. Modest goals are reached more often than overly ambitious ones and achieving them gives you the feeling of getting things accomplished. The plan does not have to be carefully written. You just don’t want to spend a study period ‘drifting’ along and achieving nothing. Planning the topics to be studied in a study session is not ‘studying’ and is not part of your 30-minute study period! Just spend a few minutes before you begin studying in deciding what you need to get done.

In addition to the above, I would suggest a very simple strategy that worked very well for me. Review your lecture notes before a day has passed since the lecture (and certainly before the next one in that series of lectures). The aim is to review the lecture before you have time to forget what happened! There are several reasons for doing this. One is that you can’t have written everything down (and I don’t expect you to.) Some things may have been said but not written on the markerboard. There might have been some connection that you noticed to another topic or another class. While there might not have been enough time to note it down, I don’t want you to forget any insight that you had. It will come to you again as you review your notes soon after writing them in the lecture. Another reason for reviewing notes soon after writing them is that after hearing and following along line-by-line during the lecture, the review gives you time to ask yourself about where the topic is going and how it fits into the series of lectures being presented.

The next step is to re-write your lecture notes. Instead of writing them verbatim, include any insights or connections that you have spotted. Also, be on the lookout for anything that doesn’t make sense. Maybe a line of algebra has been skipped or maybe there is simply an error…. In any event, make the addition to your notes. (If something question emerges, do ask me! I have office hours quite often and **I don’t get nearly enough questions about lecture material**. Lectures do take quite a while to prepare and it is good to know that someone notices links to other topics.)

Finally, summarize your reviewed notes. You will want condensed summaries for study before a test. Generate the summary that makes most sense to you. Notice that most of my comments are on the time-scale of a lecture or two. I have not referred to doing tests. However, doing tests becomes much easier if you truly stay ‘on top of things’ as I have suggested.

Dishonesty:

I would like to emphasize a point about the use of secondary sources etc. I do not object to people discussing problems that they have already attempted**. I do not object to the use of any other textbooks that you come across.** I object strongly to any verbatim, unacknowledged work done by anyone other than you that is presented as part of your work. **(This includes any passages from textbooks, any solutions that you come across in hard copy or on eLearning etc. It also includes work produced by any member of the class [past or present]). Every student in the course agrees to this limitation. Further, all students agree to tell me the source of any solution to any problem assigned in PHYS 3411 that they**

know about. No materials posted on the eLearning site become the property of the student. At the conclusion of the course, all students undertake to keep all course materials (posted solutions, graded homework etc.) **for their exclusive use. Any distribution of course materials to third parties constitutes academic dishonesty and will be reported to the Dean of Students.**

In order to further the objective of eliminating scholastic dishonesty, the University has a policy on scholastic dishonesty. This policy is clearly articulated in Subchapter F section 49.36 of the policy on student discipline & conduct adopted by the University and used in this course. A link to chapter 49 is at http://www.utdallas.edu/deanofstudents/titlev/. Students enrolling in the course are bound by this policy and are encouraged to read it. Any questions about this policy can be asked of the Dean of Students. **Any suspected cases of scholastic dishonesty will be passed along to the Dean of Students**.

Students are welcome to ask questions of my TA or me about homework problems. However, I do not authorize these students to communicate such discussions to other students. These other students are welcome to ask me questions too.

The eLearning site contains postings exclusively for the use of the person with the privilege accessing the site. Materials on this site form another secondary source that is intended to help students in my class during the semester that the posting is made. No materials posted on the eLearning site become the property of a student. **Students acknowledge that distribution/transmission of any posting made on the eLearning site constitutes scholastic dishonesty**. (See parts (d) 1 and (d) 5 of section 49.36 of the policy on student discipline & conduct.)

The question about eLearning can be extended. I will treat in the same way any pre-existing solution to a problem assigned as homework in a previous semester, a solution to a problem asked on a test, or any problem from the book. **As soon as any student in this course comes across any kind of pre-existing solution, that student must inform me of its existence and source. To do otherwise is to aid copying. (See part d (1) of section 49.36.)** In order to maintain privacy, I can be contacted by e-mail if desired.

A note about missing classes

First of all, please try not to! **If something arises that prevents you from attending class, please inform me as to why by e-mail**. Not everything that we do in class is covered in any single textbook. By missing class, you will miss either something not covered by the book that you are reading, or you will miss ‘intermediate steps’ in an author’s argument that will help you follow along. You also pass up the opportunity to ask questions of your own and miss out on hearing the questions of others. (This latter point is significant. Other students may ask questions that haven’t occurred to you yet and hence develop your understanding of the subject.)

If you **have** to miss class for some reason then it is your responsibility to get class notes or handouts given in class. Please do this quickly after your absence. (I’m not keeping tabs on your attendance and leave some of the responsibility to you.) In order to understand the next lecture, you will need to have obtained and worked through any notes etc. from the previous lecture. I give lectures from my own ‘outline notes’ that are probably not what you need. If you miss a lecture then your best source of class notes is another student who wrote down exactly what we actually did.

I tend to return graded homework and tests in class. Again, you'll miss this if you are absent from class. After I have tried to return the graded work to you a class from which you were absent, the responsibility for getting it from me becomes yours.

Comet Creed

This creed was voted on by the UT Dallas student body in 2014. It is a standard that Comets choose to live by and encourage others to do the same:

"As a Comet, I pledge honesty, integrity, and service in all that I do."

UT Dallas Syllabus Policies and Procedures

The information contained in the following link constitutes the University's policies and procedures segment of the course syllabus.

Please go to http://go.utdallas.edu/syllabus-policies for these policies.

The descriptions and timelines contained in this syllabus are subject to change at the discretion of the Professor.