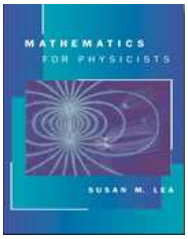
PHY 341
Mathematical Physics
Dillard University – Spring 2004

Meeting Times:
STERN 321 MWF 12:00p – 12:50p

Instructor: **Rob Salgado** Office: **Stern 307A** Voice: **(504)-816-4510**	E-mail: **rsalgado@dillard.edu** Instant-Messengers: AOL, MSN, Yahoo: **dillardphysics** (do *not* email here)	Office hours: **-to be announced**

Catalog Description:

PHY 341 Mathematical Physics (3 credits)
Theoretical and mathematical methods used in classical and quantum physics including: applications of transformation, special functions, Green's functions, perturbation theory, tensor and group theory, and Lie algebra. Class meets three hours per week for lecture. *[Prerequisite: MAT 203 (Analytic Geometry and Calculus III).]*

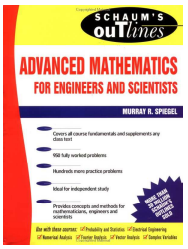


My Description:

This course surveys some of the mathematical techniques that every undergraduate physics or engineering student should know (or at least be exposed to) before graduating. Simply put: the more of this you know, the wider are your options for doing advanced projects. MAT 201-203 are prerequisites, and their material will be used extensively. *(You will need to have mastery in algebra, differential calculus, and integral calculus. Review that material now, if necessary.)* This is a demanding course that requires much effort from you.

Required Textbooks:

"Mathematics for Physicists" by Susan Lea (published by Brooks/Cole: ISBN: 0-534-37997-4)
(Optional) Highly-recommended supplement:
"Schaum's Outline of Advanced Mathematics for Engineers and Scientists"
by Murray Spiegel (published by McGraw-Hill: ISBN 0-07-060216-6)



Electronic Materials:

I will maintain a website (for now: **`http://physics.syr.edu/~salgado/341/`**) that lists the assigned problems and solutions. I will also try to make available the whiteboard/PowerPoint notes and any computer source code (e.g., Python, Maple) that I use for simulations or computations.

HOMEWORK NOTEBOOK: **read carefully**

In addition to the regular notebook you use for this class, you must maintain a dedicated "**PHY 341 Homework Notebook**" (spiral-bound notebook with at least 180 sheets) that will be brought to each class and is, with your textbook, the only aids you can use on an exam. It will be periodically collected, browsed over, graded for effort, and promptly returned.

How you will use this:

- *To keep things neat:* if you start a new problem, BEGIN ON A NEW SHEET *(not merely a new page)* and write the problem number in the upper-right corner. *To help you find things easier, you may wish to label each page of that problem in the same way.*
- After I assign homework, you will ATTEMPT EACH PROBLEM DIRECTLY IN YOUR NOTEBOOK (or first on scrap paper, if you wish). *You do not have to work problems in the order listed.*
  - Try your best to solve the problems by yourself *since this will be an indication of how well you understand the material.* Write down your thoughts on the problem. *What is it really asking? What is it trying to get me to do? What is it trying to teach me? It's okay if you don't understand at first, but you can understand it if you give it a good and honest try.*
  - If you're stuck, work together with others in a group. *Don't blindly copy the work of others. Try to understand what you write down. To help make this your work, add your own comments and fill in any missing steps to the group effort.*
  - If you're still stuck, raise questions during class or office hours *then try again*.
- Ideally, you should write *(or rewrite, if you worked on scrap paper)* your solution in your notebook. You should want to WRITE DOWN A CLEAR (i.e., logical and legible) AND COMPLETE SOLUTION that you really understand *since this notebook and your text are the only things that you can bring into an exam.*
  It is possible that you (with possibly the help of your group) were unable to solve the assigned problem by the due date. In that case, you should obtain a copy of my solutions (made available on the web). You must TRANSCRIBE [in your own handwriting] the solution *(adding your own comments and filling in any missing steps)* into your notebook.
- The notebook is expected to be in your handwriting. There should be no loose pages in your notebook.
- OPTIONS:
  - *You may wish to* retain previous attempts at problems and label them appropriately. *You don't have to (and may not want to) rip out your early attempts.*
  - *You may wish to* include a statement of the problem to accompany your solution. *You may wish to handwrite this in your notebook, or you may tape in a photocopy of the problem statement. This is the only item that need not be in your own handwriting.*
  - *You may wish to* include example problems or unassigned problems from the text. *This is good for improving your understanding of the material, and you may find this useful during an exam. You may be able to earn extra credit this way.*

How I will evaluate your notebook:

- I may or may not announce when I collect the notebooks. You must bring the notebook to each class.
- I will be looking to see that you are keeping the notebook up to date. I will only spot-check, not grade, your work.
- I will be looking to see that you are following the rules regarding organization.
- I will assign a score (to form part of your final grade) and make comments on any deficiencies. You are expected to resolve any deficiencies (including rewriting, if necessary) to avoid further penalties. The original score will not be adjusted.
- Some examples of deficiencies: *missing problems, incomplete problems after solutions are made available, improper format (improper labeling, more than one problem on a sheet, etc.), illegibility, inclusion of non-PHY 341 problems.*

Classroom Rules:

Come to class **ON TIME**. Attendance is **REQUIRED.**

"The University recognizes that a student may miss a class for legitimate reasons. In such cases these absences are excusable; however, the student must complete the Student Absence Form."…

"A professor may drop a student with 3 or more unexcused absences from a course." (2003-2005 University Catalog, page 15)

Note that your attendance is recorded on the official midterm and final grade sheets.

"Academic dishonesty will not be tolerated." (2003-2005 University Catalog, page 15)

Come to class PREPARED and EQUIPPED, having read or written any assignments. Bring your HOMEWORK NOTEBOOK and TEXT.

Limit all discussions to the PHYSICS topic under discussion.

Turn OFF all phones, pagers, radios, and other disruptive devices.

Treat each other with RESPECT.

Grades (for the lecture portion):

25% HOMEWORK NOTEBOOK

25% EXAMS (FORMAT: several short homework-type problems)

20% MIDTERM EXAM (FORMAT: several short homework-type problems)

30% FINAL EXAM (FORMAT: like two regular exams but cumulative)

A≥88%, B≥76%, C≥64%, D≥50%, F<50%. This class is not graded on a curve.

Borderline cases (between two letter grades): If your exams show an upward trend, your grade may be nudged upwards.

Exams: After every chapter or two, we will have an EXAM on these chapters. There is a cumulative one-hour *in-class* MIDTERM and a cumulative two-hour *in-class FINAL*.

Missed exams: There are **no** makeup exams. There are **no** exceptions.

If you are absent for an exam, *within one week,* you must present to me a written excuse from Academic Affairs.

Only if that excuse is valid, **your final exam will carry the weight of your missed exam.**

Otherwise, you will get no credit for the missed exam or quiz.

Dates of which you should be aware:

Martin Luther King, Jr. Holiday (Mon, Jan 19 ** no class **)

AAPT Winter 2004 Meeting (Mon, Jan 26 – Wed, Jan 28 **special arrangements will be made**)

Mardi Gras Holidays Labor Day (Mon, Feb 23 – Wed, Feb 25 ** no class **)

Midterm Period (Tue, Mar 2 – Fri, Mar 5) [Grades due Mar 8]

Spring Break (Mon, Mar 8 – Fri, Mar 12 ** no class **)

Academic Advising Day (Wed, Mar 17 ** no class **)

Easter Holiday (Fri, Apr 9 ** no class **)

Seniors Exam Period: (Wed, Apr 14 - Fri, Apr 16)

Last Day to Withdraw (Wed, Apr 14)

Last Day of Classes: (Wed, Apr 28)

Exam Period: (Fri, Apr 30 - Thu, May 6) [Grades due May 10]

Read this aloud: [the final is only given on the date and time assigned by the University --- do **not** make early travel plans]. *Read this aloud again.*

Sequence of PHY 341 topics:

- **Ch 1 Describing the Universe**
  - **1.1 A Universal Language:** *Coordinate Systems; Scalars, Vectors, and Matrices*
  - **1.2 Scalar and Vector fields:** *Vector Calculus [this is a rapid review of MAT 203… you are expected to know this]*
  - **1.4 Helmholtz Theorem:** *Vector Calculus theorem*
  - **1.5 Vector Spaces:** *Vector Algebra*
  - **1.6 Matrices:** *(Matrix) Linear Algebra, Systems-of-Equations [aspects you might see in MAT 131, MAT 303]*
- **Ch 2 Complex Variables** *[basics for MAT 340]*
  - **2.1 All About Numbers:** *Complex Numbers*
  - **2.3 Complex Series:** *Real and Complex Series*
- **Ch 3 Differential Equations** *[basics for MAT 302]*
  - **3.1 Some Definitions**
  - **3.2 Common Differential Equations Arising in Physics**
  - **3.3 Solution of Linear, Ordinary, Differential Equations:** *constant coefficients, non-constant coefficients, power-series*
  - **3.5 Partial Differential Equations: Separation of Variables**
- **Ch 4 Fourier Series** *[the mathematics behind "Superposition"] [you need to review how to do integrals of trig functions]*
- **Ch 5 Laplace Transforms** *[a technique to turn a hard problem into an easier one]*
- **Ch 6 Generalized Functions in Physics** *[the mathematics behind "Dirac delta functions"]*
- **Ch 7 Fourier Transforms** *[a technique to turn a hard problem into an easier one]*
- **Ch 8 The Sturm-Liouville Problem** *[an algebraic technique to solve an important differential equation]*

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      January          Rough Schedule
Su Mo Tu We Th Fr Sa
              [8] 9     (1.1.1)
   12    14    16      (1.2, 1.4)
  [19]   21    23      (1.5)
  {26    28}   30      (1.6) (with special arrangements)
      February
    2     4     6      (2.1) (2.2) (3.1)
    9    11    13      (3.2) (3.3)
   16    18    20      (3.5)
  [23 MG 25]   27      (4)
       March
    1 ____3_____5      Midterm Exam on Monday or Wednesday
   [SPRING_BREAK]
   15   [17]   19      (4)
   22    24    26      (5)
   29    31
       April
                2      (6)
    5     7    [9]
ES 12    14    16      (7)
   19    21    23      (8)
   26    28|  _30
         May
   _3__4__5__6
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