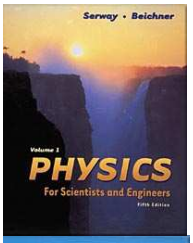
PHY 390
Optics and Modern Physics
Dillard University – Spring 2005

Meeting Times:
M W F (11:00 AM- 11:50 AM) Main Campus / Stern Hall / 315

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**

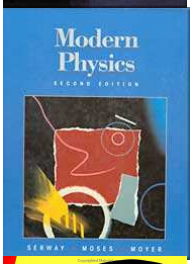
Catalog Description:

PHY 390 Optics and Modern Physics (3 credits)
Review of geometric and physical optics; optical analysis of typical systems, the experimental foundations of quantum physics, Schrodinger equations and the wave functions. Atomic and molecular spectra, special relativity, electricity and radiation, introductory nuclear physics. Class meets three hours per week for lecture.
[Prerequisite: PHY 230 (General Physics III) and junior standing, MAT 203 (Analytic Geometry and Calculus III).]



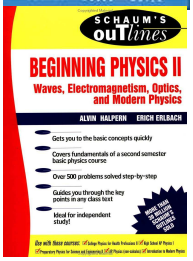
My Description:

Sinuosoidal Oscillations and Waves. Superposition of Waves. Maxwell Equations and Electromagnetic Waves. Geometrical Optics: basic laws, mirrors, and lenses. Physical Optics: interference, diffraction, polarization. Relativistic Kinematics and Mechanics. The Quantum Theory of Light: Photons. Introductory atomic and nuclear physics. The Schrodinger Equation.



Required Textbook:

"Physics for Scientists and Engineers" (5th edition) by Raymond A. Serway and Robert J. Beichner
(published by Brooks/Cole: ISBN: 0-03-031716-9)
**Homework is assigned from the 5th-edition.
If you use another edition, it is your responsibility to get and do the 5th-edition problem or its equivalent in your edition.



(Optional) Highly-recommended supplements:
"Modern Physics" (2nd edition) by Serway, Moses, and Moyer (published by Brooks/Cole: ISBN 0-03-001547-2)
"Schaum's Outline of Preparatory Physics II: Electricity and Magnetism, Optics, Modern Physics"
by Erich Erlbach (Preface), Alvin M. Halpern (Preface) (published by McGraw-Hill: ISBN 0-07-025707-8)

Electronic Materials:

I will maintain a website (for now: **`http://physics.syr.edu/~salgado/390/`**) 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.

Classroom Rules:

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

Grades (for the lecture portion):

25% HOMEWORK NOTEBOOK
25% 5-minute WEEKLY QUIZZES (FORMAT: multiple-choice questions, a short problem, and vocabulary definitions)
25% IN-CLASS MIDTERM EXAM (FORMAT: several short homework-type problems)
25% 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.

Quizzes: Weekly Quizzes are announced during the class before and are given at the start of the class. All quizzes are due 6 minutes into the period.
No makeups or extensions. Don't be late. No exceptions.

Exams: There is a cumulative one-hour *in-class* MIDTERM and a cumulative two-hour *in-class FINAL*.

Missed exams or quizzes: There are **no** makeup exams or quizzes. There are **no** exceptions.
If you are **absent** for an exam or quiz, *within one week*, you must present to me a **written excuse from Division of Natural Sciences**.
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.

***HOMEWORK will be assigned (See HOMEWORK NOTEBOOK below.)**
HOMEWORK solutions will be discussed only during a weekly Special Session of Office Hours (submit your schedules to me.)

Sequence of PHY 390 topics that I will emphasize and the Learning Objectives:

What you really need to know about Waves

Serway-PSE Ch 16 Wave Motion, 17.4 Spherical and Plane Waves

Describe, define, and interpret physical and mathematical aspects of wave motion.

Serway-PSE Ch 18 Superposition and Standing Waves

Describe, define, and interpret physical and mathematical aspects of interacting waves

Classically, Light is a Transverse Electromagnetic Wave

Serway-PSE Ch 34 Electromagnetic Waves

Describe the four Maxwell Equations and its relation to Light.

Geometric Optics

Serway-PSE Ch 35 The Nature of Light and the Laws of Geometric Optics

Describe and apply the Laws of Rectilinear Propagation, Reflection, and Refraction.

Serway-PSE Ch 36 Geometric Optics

Analyze and explain how mirrors and lenses form images.

Physical Optics

Serway-PSE Ch 37 Interference of Light Waves

Describe, analyze, and interpret interference of Light.

Serway-PSE Ch 38 Diffraction and Polarization

Describe, analyze, and interpret diffraction and polarization of Light.

Relativity reveals some special properties of Light and revises our view of Space and Time

Serway-PSE Ch 39 Relativity [although we will follow a different presentation]

Describe Einstein's postulates of Special Relativity. Describe our revised understanding of space, time, energy, and momentum. Analyze a relativistic collision and interpret $E=mc^2$.

Quantum Mechanically, Light also has Particle-like properties

Serway-PSE Ch 40 Quantum Theory of Light

Describe the particle-like properties of Light.

****Quantum Mechanics reveals some special properties of light and matter.***

Serway-PSE Ch 41 Quantum Mechanics

Describe the Two-Slit Experiment and its interpretation. Describe, define, and interpret the Schrodinger Equation.

**Time Permitting*

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       January
Su Mo Tu We Th Fr Sa
   10    12    14      WAVES
   []    19    21
   24    26    28
   31
      February
          2     4      ELECTROMAGNETIC WAVES
   [      ]    11      GEOMETRIC OPTICS
   14    16    18
   21 MID-T-E-R-M
   [
        March
                 ]
    7    []    11      GEOMETRIC OPTICS (MIRRORS AND LENSES)
   14    16    18
   21    23    []      INTERFERENCE
   28    30
        April
                1      DIFFRACTION AND POLARIZATION
    4     6     8      RELATIVITY
   11    13    15      QUANTUM THEORY OF LIGHT
   18    20    22      QUANTUM MECHANICS
   25    27    F
         May
    I--N--A--L
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Dates of which you should be aware:

AAPT Winter 2005 Meeting (Mon, Jan 10 – Wed, Jan 12 **special arrangements will be made**)
Martin Luther King, Jr. Holiday (Mon, Jan 17 ** no class **)
Mardi Gras Holidays Labor Day (Mon, Feb 7 – Wed, Feb 9 ** no class **)
Midterm Period (Tue, Feb 22 – Fri, Feb 25) [Grades due Feb 28]
Spring Break (Mon, Feb 28 – Fri, Mar 4 ** no class **)
Academic Advising Day (Wed, Mar 9 ** no class **)
Easter Holiday (Fri, Mar 25 ** no class **)
Seniors: Last Day (Thu, Apr 14), Exam Period: (Mon, Apr 18 - Wed, Apr 20)
Last Day to Withdraw (Wed, Apr 20)
Last Day of Classes: (Wed, Apr 27)
Exam Period: (Fri, Apr 29 - Thu, May 5) [Grades due Mon, May 9] - the final will be given on the assigned date and time. No exceptions.

HOMEWORK NOTEBOOK:

Homework will be assigned periodically. The bulk of Exam and quiz problems are generally based on homework problems, textbook problems, and textbook examples.

Most of the learning you do in this course is done by **your doing homework problems outside of class!**

However, be sure that you can do the problems *by yourself* since you'll be working on many exams *by yourself*.

If you need help with your homework, please visit me (with your textbook and your notebooks and with proof that you have tried the problems) during Office Hours… the sooner the better.

** In addition to the regular notebook you use for this class, you must maintain a dedicated "**HOMEWORK NOTEBOOK**" for this class. (spiral-bound notebook with at least 180 sheets). It will be periodically collected, browsed over, graded-for-effort, and promptly returned. You must bring the notebook to each class and to office hours.

How you will use this: (the essential points---a detailed description will be provided on another sheet.)

- You are basically creating your own personal "solution manual" to the assigned homework problems.
- You should want to WRITE DOWN A CLEAR (i.e., logical and legible) AND COMPLETE SOLUTION that you really understand.
  - Start a new problem on a new sheet with the problem number in the upper-right corner…*for organizational purposes*.
  - 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*.
- 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.

How I will evaluate your notebook:

- I may or may not announce when I collect the notebooks. (It will be at least once every two weeks.)
- 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. *(Again, start a new problem on a new sheet.)*
- 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, and inclusion of anything other than this course's homework problems.*

Comments will be written on the last sheet. Do not destroy that last sheet!