Phys 122-MWF
Fall 2010

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Title: Fundamentals of Physics II

Lecture MWF 1:00 PM, Phys 1410

0101 M 3	Phys 1402
0102 Tu 9	Phys 4208
0103 Tu 11	Phys 0405
0104 Tu 1	Phys 1219

Textbook: There is no textbook. Class discussion is based on online text. There are several books available as listed below. Buy the cheapest book and look at the attached "Course Content" to identify the relevant chapters for reading. If you have questions come by and we will discuss them.

Introduction

Welcome to Phys 122. Most of you have recently "endured" the first semester of a course on trying to understand the fundamental properties of the observable part of our universe by using the methods of Physics. As always, the attempt is to develop the simplest and most economical description. Consequently, the results are SIMPLE but not necessarily easy to comprehend.

By and large, Phys 121 dealt with natural phenomena pertaining to motion of particles and rigid bodies supplemented by a brief discussion of Thermodynamics. The ensuing set of studies will focus on waves: "A Sound and Light Show." We interact with our surroundings using our ears and eyes. Surely, you would agree that it would be fruitful to understand the agencies which mediate these interactions.

Hopefully, at the end of this two semester experience we will develop a good feel for the two essential ingredients of our observable universe – Matter and Radiation.

Math Background

As in Phys 121 we will not use calculus. However, algebra and trigonometry are used throughout. Also, do review the essentials of vector algebra [see Notes from PHYS 121]. If you need help, please get it as soon as possible. As described below, I am always available. Never hesitate to let me know if you are experiencing difficulties.

Every topic that is discussed in class is based on the notes online. I am giving you a copy of the notes from PHYS 121

Reading List

1. College Physics – Serway/Faughn
   Chaps 13-24 Thompson, Brooks/Cole
2. Physics – Cutnell and Johnson
   Chaps 15-27 Wiley
3. Essential College Physics – Rex and Wolfson
   Chaps 7,11 and 15-22 Addison-Wesley
4. Physics – Walker
   Chaps 13,14,19-26,28 Prentice Hall
5. Contemporary College Physics – Jones/Childers
   Chaps 14-24 McGraw Hill
6. Physics – Giambattista, Richardson, Richardson
   Chaps 10-12, 16-23, 25 McGraw Hill

Test Questions/ Review

About two weeks prior to every exam, a set of test questions will be posted online. The idea is that you should have enough time to formulate your answers and I will discuss the same in a review session which is typically scheduled for the evening of Tuesday prior to the "hourly". The review for the final exam will be scheduled later.

Homework

Weekly homework problems are available online. Do them Although we will not collect and grade your homework, there will be several quizzes using homework problems directly. Also, the hourly examinations will have somewhat similar problems. The bottom line is: if you cannot do the homework, you cannot expect a good grade.

Solutions

Solutions will be posted each week in glass cases outside the lecture halls as well as online at...

Tests

a) There will be three (3) examinations, each lasting a full period. Dates are in the attached schedule.

b) Ten (10) 10-minute quizzes during class (Q on schedule)

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c) Avoid make-ups/No make-ups will be given for Quizzes.

d) The final exam is scheduled for Tues., Dec. 14, 2010 from 1:30-3:30 PM
You cannot pass the course without taking the final.

Laboratory

The experiments in the laboratory are an integral part of this course. Ten (10) experiments are scheduled. All must be done. You cannot pass this course unless you do every experiment, and submit a report.

Grading

Your grade is figured out as follows:

Best 8 of 10 Quizzes	100
Lab Reports	100
Best 2 of 3 "hourlies"	200
Final Exam	200
*Discussion	$\leq$ 50 (Bonus)

*Note: You earn 50 points if you have 5 visits prior to every exam and you have a perfect score on every exam (100+100+100+200)/10!

Extra Help

a) The instructor is available for discussion at all times. I am usually in my office (Z-2331) or laboratory (Z-2221) from about 9:30 AM to about 6:00 PM, Monday through Friday. Feel free to walk in. If you desire an especially extended visit, call 56144 or 56159 to ensure that I have a time slot free. If you have any difficulty at all, never hesitate to drop by. Also I keep a record of your visits. You can earn up to 50 points (or 10 percent of your earned grade points) by showing up with questions*. You may call me at home (301-345-5308) but no later than 10 PM.

b) T.A.'s will post their office hours

c) Slawsky Clinic is an excellent (free) tutoring service. It is staffed by very dedicated physicists who can help improve your problem solving skills. Do take advantage of this highly acclaimed feature of the physics department.

PHYS 122 – Fall 10
Contents of the Course

Oscillations
Hookes's Law Force
Spring-Mass Oscillators
Oscillator-Circular Motion
Simple Pendulum
Physical Pendulum
Forced Oscillations-Resonance

Waves-Mechanical
Travelling Waves
Sine/Cosine Waves – Wavelength, Frequency, Velocity
Transverse Waves on Stretched String
Reflection – Standing Waves
Principle of Superposition
Normal Modes – String Instruments, Wind Instruments

Sound (in Gases)
Displacement/pressure Wave
Speed
Intensity
Doppler Effect
Beats
Interference
Resonance

Charge/ $\vec{E}$ -Fields
Charge
Positive
Negative
Conductor
Insulator
Triboelectricity
Van de Graaf

Coulomb Force ($F_{\vec{E}}$)
Coulomb $\vec{E}$ – Field

Dipole Field
Flux of $\underrightarrow{E}$, Gauss' Law
Point Change
Line of Charge
Charge Sheet
Hollow Sphere/Conductors
Uniform Solid Sphere/Insulator
Conductor in $\underrightarrow{E}$ - Field, Dipole in $\underrightarrow{E}$ – Field

Electrical Potential
Coulomb Force – Conservative
Energy Conservation Law – Mechanical/Electric
Electrical Potential Calculations
Generator of Coulomb E
Capacitor – Capacitance (C)
Parallel Plate C: Vacuum, Conductor, Electric
Energy Stored in $\underrightarrow{E}$ – Field
Mulh – Capacitor Circuits

Electrical Current
Flux of Charge – Conduction Current
Resistor – Resistance (R)
Power Loss
Conductivity
Multiple - Resistors

D.C. Circuits
Kirchhoff's Rules
Battery – Resistor Circuits
Battery – R.C. Circuits

$\underrightarrow{B}$-Field
Force on Moving Charge – Cyclotron, Velocity Selector, Mass spectrometer
Force on Current
Torque on Current – Loop – Magnetic Moment
Electric Motors
Generation of $\underrightarrow{B}$ – Field – Ampere's Law
Current – Current Force
Solenoid
Bar Magnet
Gauss'Law for $\underrightarrow{B}$

E-M Induction
Faraday – Lenz's Law
Non-Coulomb $\underrightarrow{E}$-Field
Inductor – Inductance (L)
Self Inductance – Solenoid
Energy in $\underrightarrow{B}$-Field
Battery – L – R Circuit
A.C. Generator

A.C. Circuits
L- C Circuits (Oscillatory)
L – C – R Circuits, Phasors
Reactance, Impedance
Power Factor, Resonance

Maxwell's – Equations
Displacement Current
E M Waves – Radiation
AM, FM, TV, Microwaves, Heat, Light, X-Rays, γ-Rays
EM Waves – Energy Propagation by $\underrightarrow{E}$ and $\underrightarrow{B}$ Fields

Geometrical Optics
Reflection – Fermat's Principle
Refeaction – Snells' Law – Side Jump
Total Internal Reflection
Dispersion – Newton's Experiments

Geometrical Optics – Image Formation
Reflection – Mirror: Plane, Spherical
Refraction – Flat Surface, Thin Lenses

Wave Optics
Production of Light
Coherent/Incoherent Sources
Interference – 2 Slit, Multi Slit
Diffraction – Single Slit

	Date	Subject	Problems
Wk 1			
	Aug. 30 M	Rev 121/Ocillations	
	Sep. 1 W	Oscillations/Waves	
	3 F	Waves/Sound	
Wk 2			
	Sep. 6 M	Labor Day	
	8 W	Sound	
	10 F (Q)	Sound	
Wk 3			
	Sep. 13 M	Sound/Charge	
	15 W	Coulomb $\underrightarrow{E}$	O
	17 F (Q)	Coulomb $\underrightarrow{E}$	
Wk 4			
	Sep. 20 M	Gauss's Law	
	22 W	Gauss's Law	N
	24 F (Q)	Electrical Potential	
Wk 5			
	Sep. 27 M	Capacitors	
	29 W	Capacitors	
	Oct. 1 F	Exam 1	L
Wk 6			
	Oct. 4 M	Current	
	6 W	Current/DC Circuits	
	8 F (Q)	DC Circuits	I
Wk 7			
	Oct. 11 M	DC Circuits	
	13 W	$\underrightarrow{B}$-Field	
	15 F (Q)	$\underrightarrow{B}$-Field	N
Wk 8			
	Oct. 18 M	$\underrightarrow{B}$-Field	
	20 W	Induction	
	22 F (Q)	Non-Coulomb $\underrightarrow{E}$	E
Wk 9			
	Oct. 25 M	Non-Coulomb $\underrightarrow{E}$	
	27 W	AC Circuits	
	29 F (Q)	AC Circuits	
Wk 10			
	Nov. 1 M	Maxwell's Equations	
	3 W	Maxwell's Equations	
	5 F	Exam 2	

Wk 11		
Nov. 8 M	EM Waves	
10 W	EM Waves	
12 F (Q)	Geom Optics	
Wk 12		
Nov. 15 M	Geom Optics	
17 W	Mirrors	
19 F (Q)	Mirrors	
Wk 13		
Nov. 22 M	Lenses	
24 W	Lenses	
26 F	Thanksgiving	
Wk 14		
Nov. 30 M	Wave Optics	
Dec. 1 W	Wave Optics	
3 F	Exam 3	
Wk 15		
Dec. 6 M	Wave Optics	
8 W	Wave Optics	
10 F (Q)	Review	

ONLINE

FINAL EXAM Tues. Dec. 14, 1:30-3:30pm